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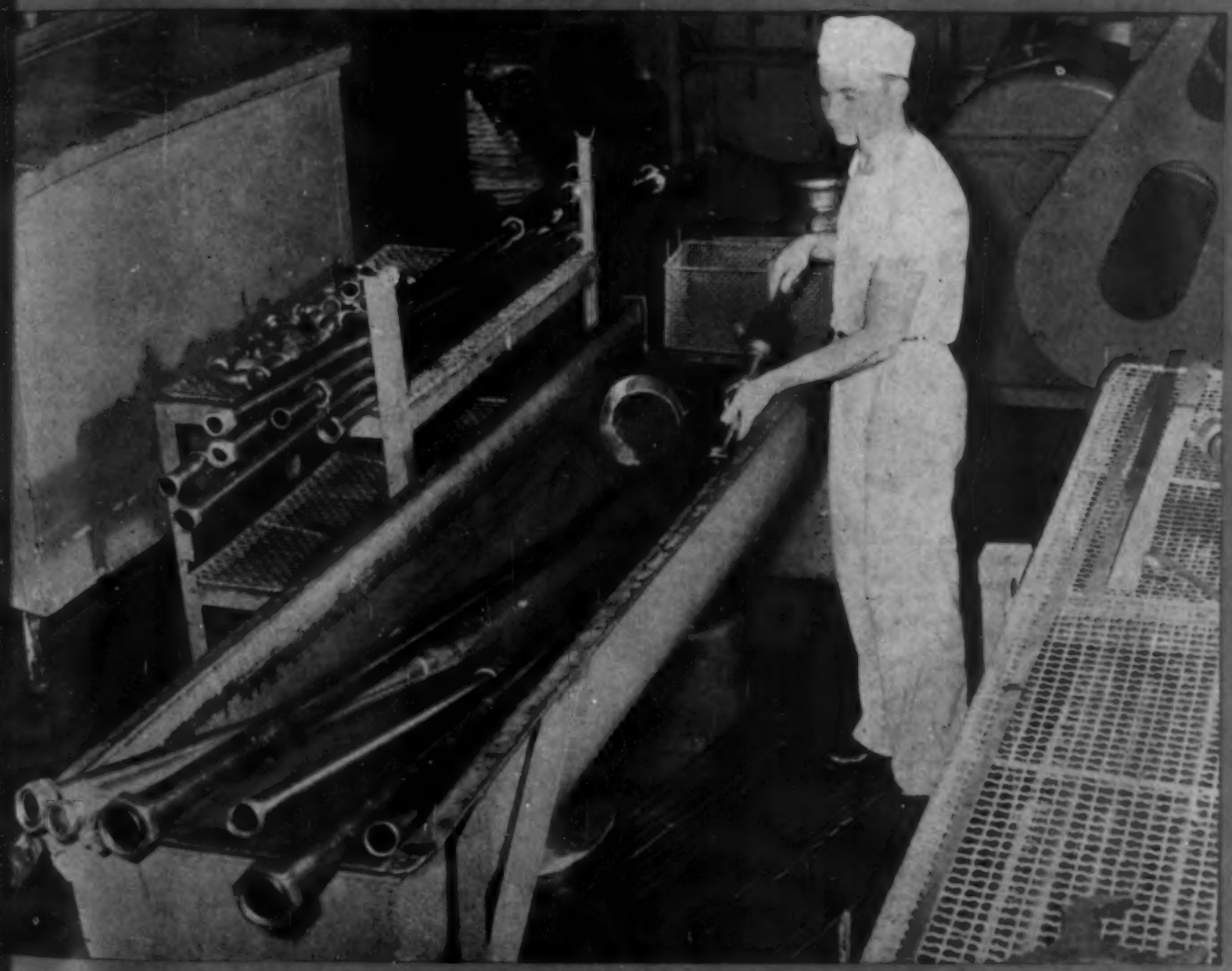
17—*Journal Section of the American Society of Heating and Ventilating Engineers*



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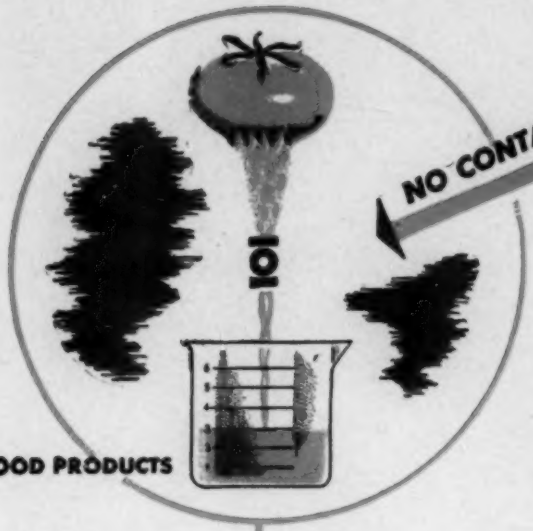

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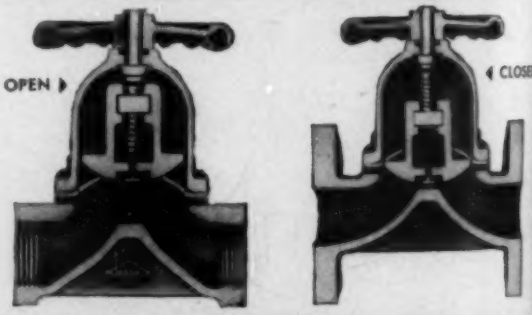

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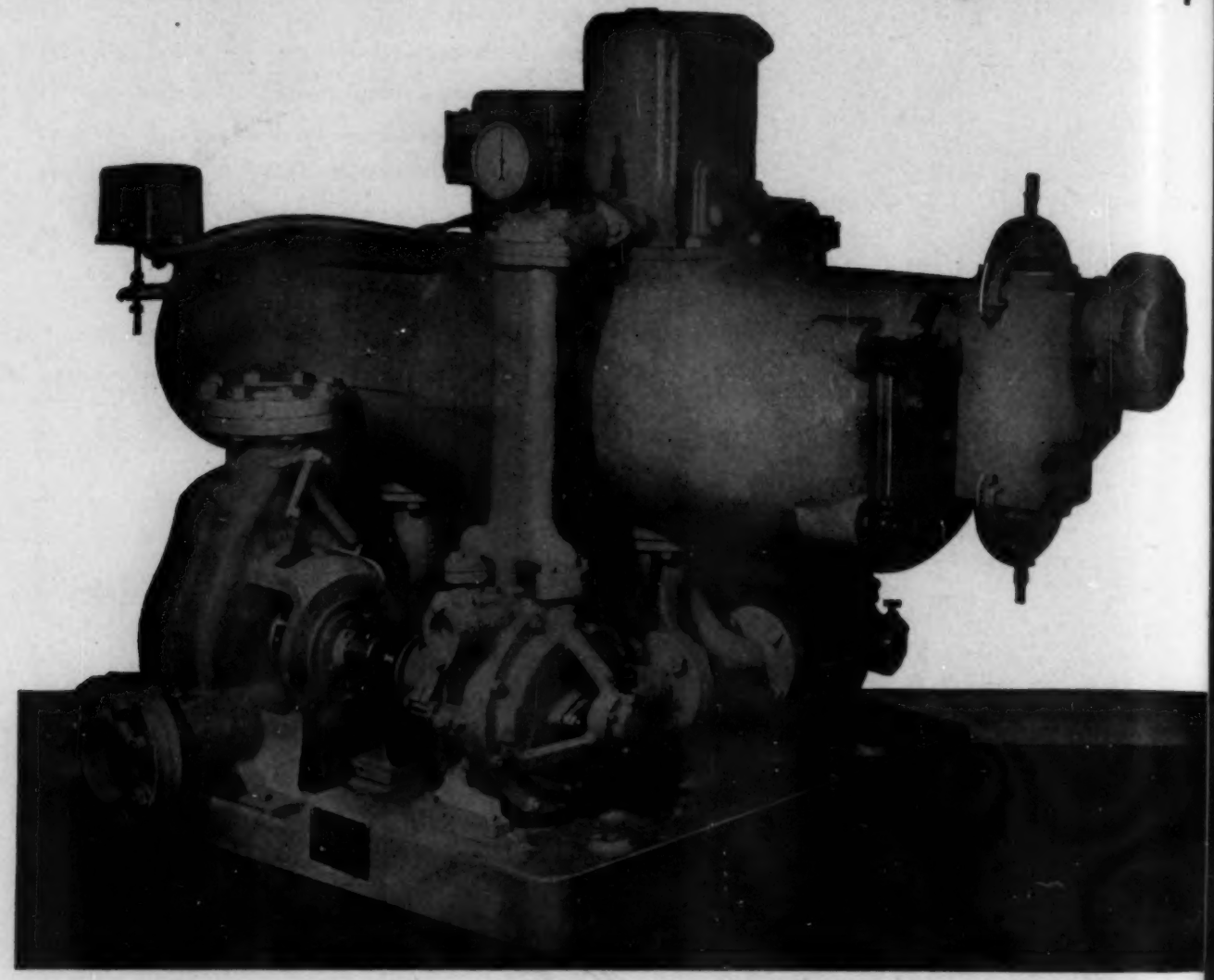
Where Heat Must Not Fail— Install this SAFE Heating Pump!



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Water to wells may derive from

G. E. CLANCY, physicist and consulting engineer to Drayer-Hanson, Inc., of Los Angeles, is nationally known as an authority on the heat pump and the reversible cycle refrigeration system. He discusses here the factors to be considered in deciding "for" or "against" the use of well water in air conditioning, refrigeration, and heat pump installations. He describes various types of supply and disposal wells, and gives practical pointers on their construction and operation. In a second article, he will consider the use of ground water for heat supply or heat disposal without pumping it from the well

WATER from WELLS

Practical Pointers on Its Use for Refrigeration, Air Conditioning, and the Heat Pump

WATER FROM wells has been used extensively in some localities for larger industrial applications of refrigeration—such as ice plants and cold storages—and for refrigeration plants for air conditioning. These cases of well water utilization are usually where the local conditions are so obviously favorable that they could not be overlooked.

The advisability of using sea water, or water from lakes or from rivers, is usually quite apparent, for the temperature of the water is known or is readily ascertainable, as is also the location of the project with respect to the source of water supply (both as concerns elevation and horizontal separation). The case of wells is not so simple, for consideration must be given to a number of factors before the project is undertaken or even before its cost is estimated. These factors are often unknown but not always indeterminable, at least within limits satisfactory for determination of the advisability of the project and recommendation of the procedure to be followed. They include (1) the water level; (2) the amount of water that can be pumped with a given drawdown. (Reduction of the level of the water in the well, while pumping below the normal water level, is independent of reduction due to depletion of supply; it is only the result of inability of water to flow from the surrounding water bearing soil to the well without a considerable difference in level to cause the flow); (3) disposal of the water after it has been used; (4) the temperature of the water; (5) the quality of the water; (6) the reliability of the source, especially from year to year; and (7) the cost of drilling and casing the well.

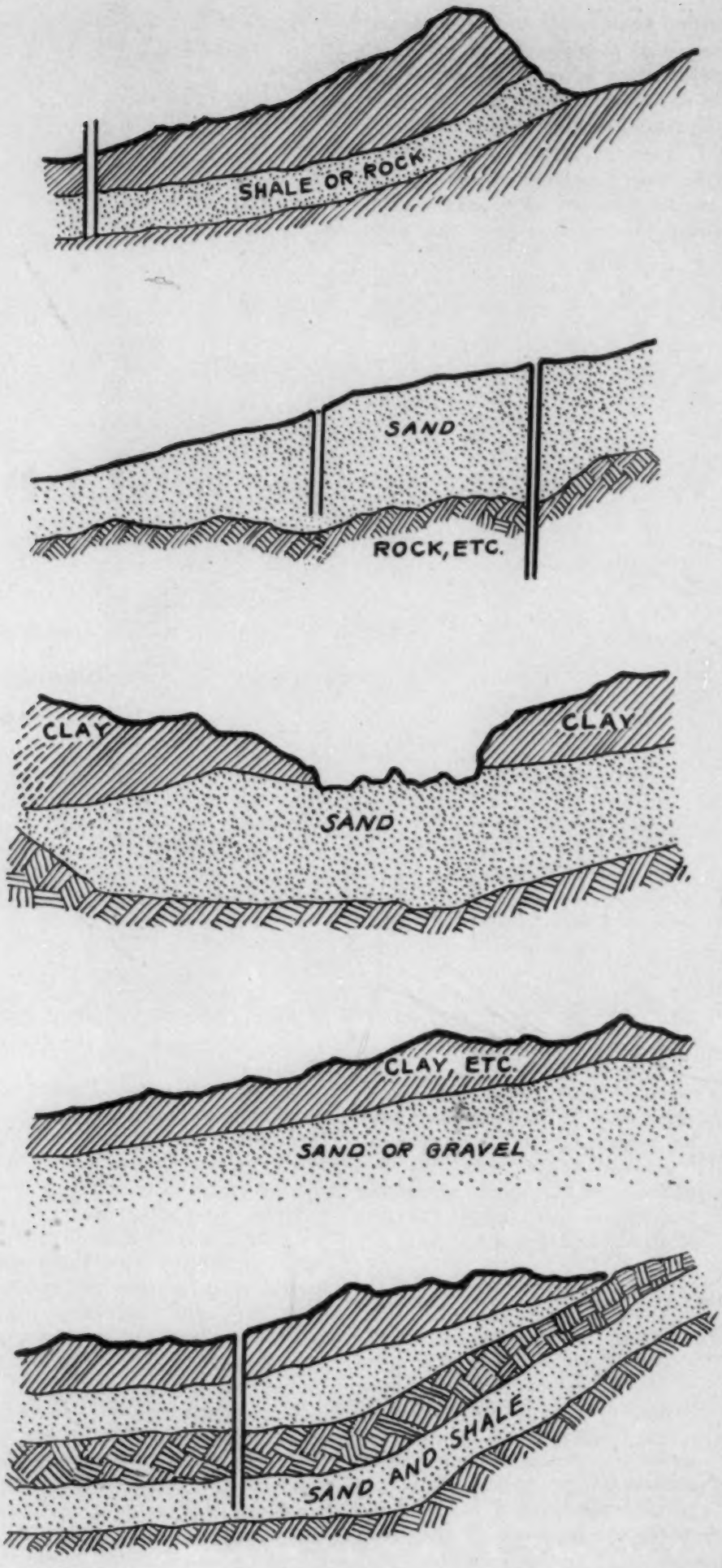
Conditions Are Definitely Local Ones

It is quite apparent that these conditions are definitely local ones to such an extent that they might be quite different within points only a few hundred yards apart. This makes it difficult to adapt standardized unit air conditioning apparatus utilizing well water, it requires careful study of the local conditions and the individual project, and it adds to the number of unknown factors which confront the engineer and the contractor. The hesitancy of the vendor to recommend (or the prospect to buy) where there are uncertainties has no doubt resulted in the use of other types of apparatus in many cases where a well might have served the purpose much better.

Once the conditions have been established within a given locality, then further exploitation of wells may be carried forward with a reasonable degree of certainty.

Before considering the ways of using wells or the utilization of well water after the conditions are known, let us consider the various ways by which water may have reached the well and some of the conditions which may obtain in the ground surrounding the well.

Rain water, melting snow, and water from lakes (at a higher level), percolates down through the soil, and thence tends to travel in a substantially horizontal direction toward rivers, lakes, or the ocean



Water to wells may derive from several sources, as indicated in these sketches. The top one illustrates flow through stratified rock underlying a surface of clay or water-impervious rock, the next represents direct percolation from the surface to lower levels, and the third shows water in valley bottoms usually through a sand or gravel stratum overlying a water impervious substratum. The fourth sketch from the top represents water flowing through a porous stratum underlying an impervious stratum. The last sketch shows a well driven through one source and cased off and further driven to greater depth to develop an artesian flow at a different temperature

more or less as it would on the surface—except that the gradient may be quite different from that of the surface, if strata impervious to water underlying or overlying the water-bearing stratum have gradients different from that of the surface.

How Water Gets to Well

Other than streams in caves and subterranean passages (which may be regarded as a special and somewhat unusual condition) water to wells may derive from:

1) Flow through stratified rock underlying a surface of clay or water-impervious rock.

2) Direct percolation from the surface to lower levels into that which really amounts to ponds or lakes in a water-impervious substratum.

3) Water in valley bottoms usually through a sand or gravel stratum overlying a water-impervious substratum.

4) Water flowing through a porous stratum of glacial drift or marine deposit underlying an impervious stratum (usually clay).

It is apparent that in driving a well we may find two or more water-bearing strata each independent of the other and differing in quality, pressure, and temperature.

It is not unusual to find a well driven through source No. 1 which is cased off and further driven to greater depth through a rock or shale stratum to develop an artesian flow at a different temperature from source No. 1 (or possibly source No. 4).

Unless the water is unusually near the surface (less than 20 ft) water from source No. 2 will probably stay near the yearly mean temperature above the surface-

much the same condition but with somewhat greater variation prevails in the case of source No. 3.

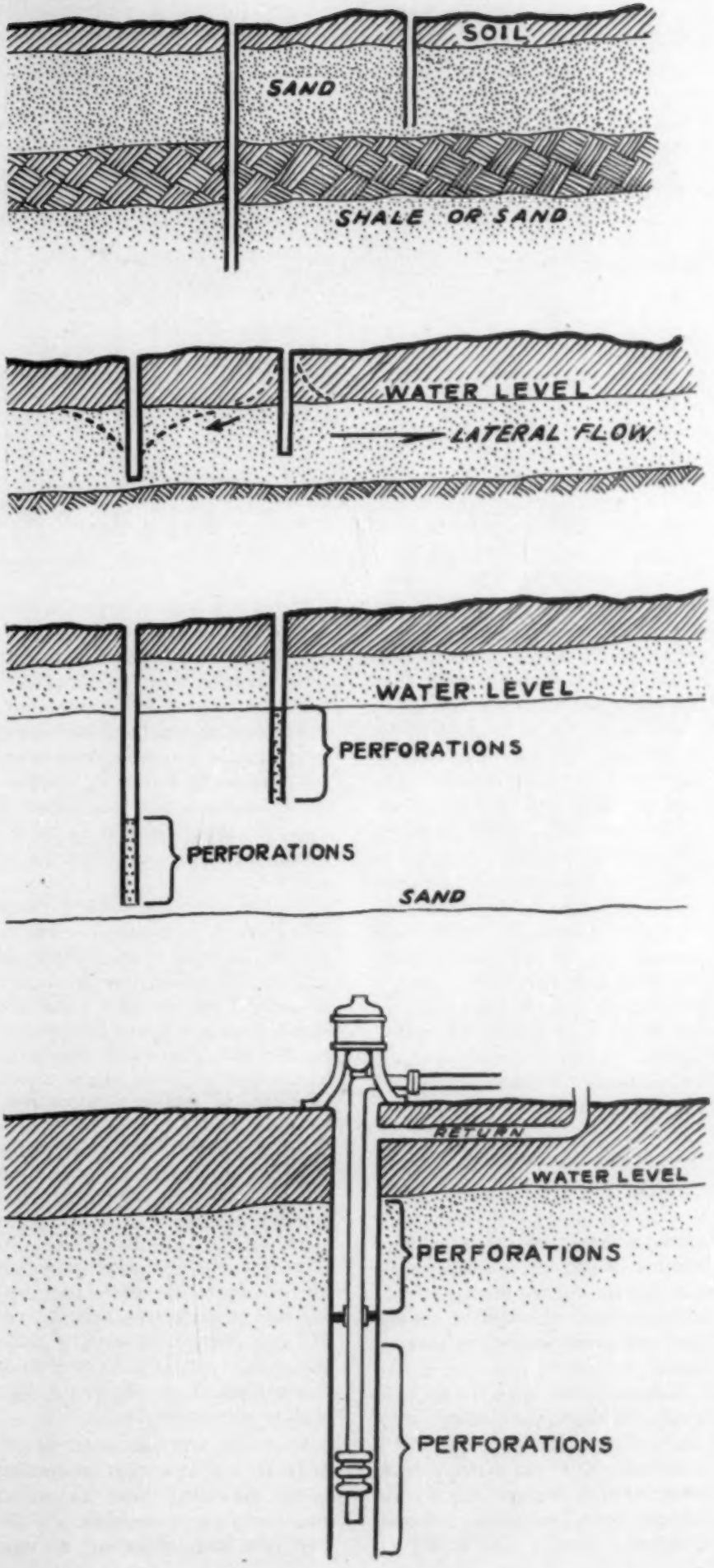
In the cases of sources Nos. 1 or 4, the temperature is more likely to vary with the original source which may be at a much higher level and different temperatures—also, water from deep strata may be quite warm due to seepage toward the hot core of the earth at great depths through a fault or crevices.

When Should Well Be Used?

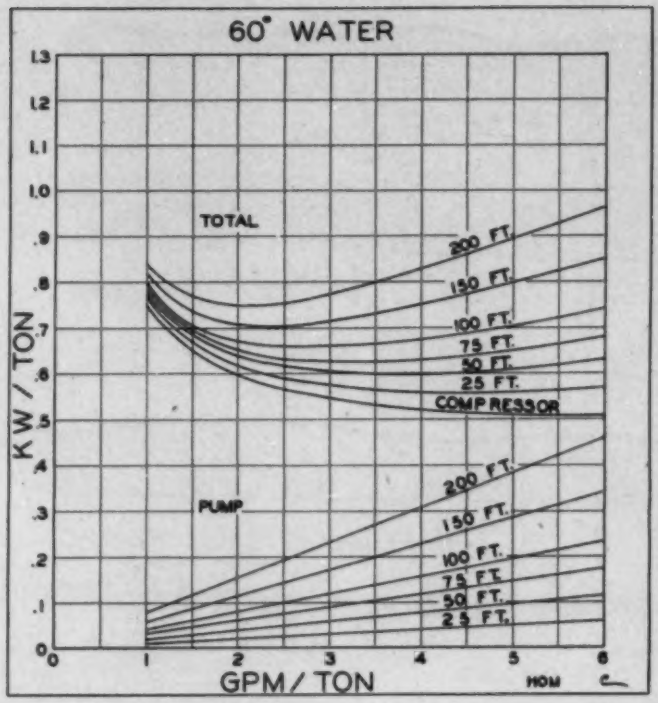
When used for cooling alone (refrigeration or summer air conditioning) the water temperature from the well plus the pumping head should be compared to the mean wet bulb temperature plus operating temperature difference for the operating season plus the power for auxiliary apparatus (which may be a pump only for a gravity cooling tower, or pump and fans for air evaporative condensers and forced draft cooling towers). Comparative quality of the water must also be taken into consideration.

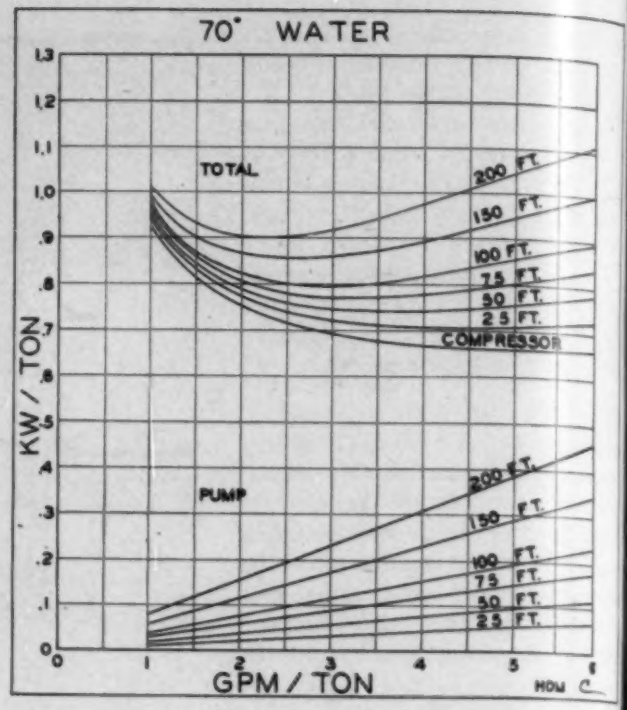
Water cannot be pumped from depths much greater than 150 ft unless there is a large temperature advantage to compensate for the pumping power expended. Likewise, even if the year 'round temperature is advantageous, direct pumping for a reversible refrigeration cycle plant (heat pump) does not seem to be advisable from depths over 200 ft.

This is especially true in the case of small installations, for deep well turbine pumps are not efficient in small sizes (especially when the head is high) partly because of the power transmission losses which are unavoidable with a long driving



Disposal wells for getting rid of the water after it has served its purpose may be of several types. If the water comes from a deep well, it may be disposed of in a shallow surface stratum, as indicated in the top sketch. The next one illustrates the point that the drawdown of the supply well and the buildup of the disposal well should be considered if the wells are small or close together. Where the water-bearing stratum is close to the surface but quite deep in itself, it is possible to stratify the water by obtaining it from a considerable depth and returning it to a higher level, as shown in the sketch third from the top. The supply and the disposal wells may be combined into one, as indicated in the bottom sketch





shaft and partly because of the number of stages required. The cost of the well and well pump in such cases is likely to be so high that the entire project is inadvisable.

Well water, if it is available at proper temperatures, may also be used for circulation through blast coils to lessen the load on an air conditioner—especially if applied to the make-up (outside) air stream.

Water of the same quality—especially as concerns hardness and temporary hardness—pumped once through from a well usually forms less scale and incrustation than if recirculated through some evaporative device such as a cooling tower, wherein partial evaporation of the water tends to concentrate the scale-forming salts.

How Wells Are Drilled

Before proceeding further with the application of the well and its appurtenances (or the ground in which it is placed), it seems advisable to consider the well itself.

Dug wells are not to be considered except in special or unusual cases.

Comparatively shallow wells drilled through clay, adobe, sand, or gravel are frequently drilled with a cable bit or a mud scow (a heavy bailer with a cutting edge on the bottom) with the casing following it down.

The casing may be comparatively light sheet iron, 14 to 11 gage, usually double short lengths 4 to 6 ft being made so that one fits outside the other with the joints staggered; this casing is usually pulled down by hydraulic cylinders. Such wells are frequently driven in sand or gravel to depths of about 200 ft in sizes 16 in. diameter and up for development of large quantities of water.

Smaller sizes are usually cased with screw coupled casing or standard weight pipe; in some cases the joints are welded instead of coupled by screw joints. In such cases the casing is usually driven by a weight on the drill line which acts as a hammer. These wells may be driven to depths of several hundred feet. In some cases, where the well bore must pass through a considerable stratum of impervious rock, the casing may be stopped upon reaching the rock and continued at a smaller size below it. Rotary drill rigs are frequently used for such work. Within the past decade rotary auger type drilling outfits have been much used for shallow wells of small size—and even in larger sizes up to 24 in. for very shallow operations.

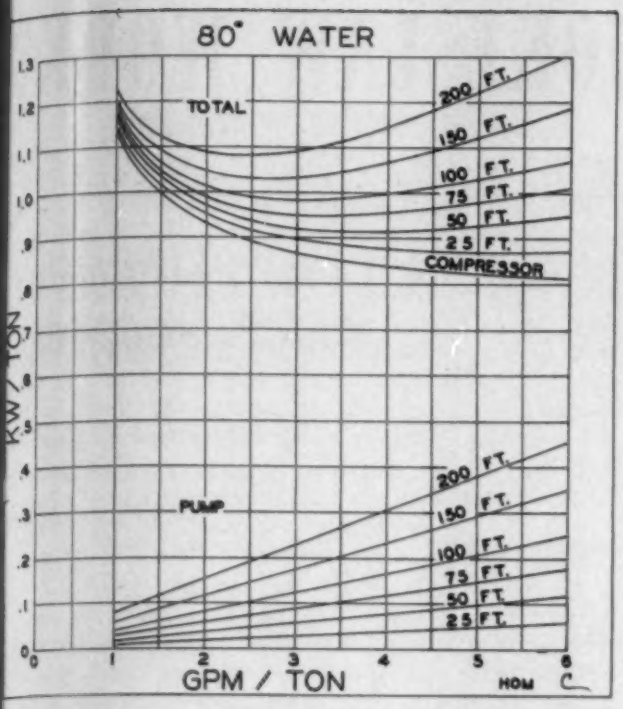
After the well has been drilled and cased, it is usually perforated below the water level to permit easier ingress of the water to the well bore and to prevent drawing large amounts of sand into the well through the bottom opening—which might in some cases result from heavy pumping if the casing were not perforated. Even so, it is often necessary or advisable to install a sand trap above the pump head and before the apparatus to be served. This is especially true when another well is used for waste water disposal, as sand pumped from the supply well may partly fill and choke up the disposal well.

It is seldom advisable to perforate a well casing in sand or gravel above the level of the water in the well when it is being pumped, as backwash and refill effects which occur on stopping the pump tend to wash sand into the well.

The most reliable way of obtaining well information is to consult local well contractors and well pump vendors. City and county engineers' offices may also be able to supply usable data.

In most cases some of these people will be able to furnish most of the desired information, except (possibly) accurate temperature records. In some cases, data concerning lateral flow of underground water may be lacking.

It is usually best to follow rather closely the drilling and casing procedures being used in the locality first, because they have been proved, and second, because the



These three charts show the power required for pumping water from various depths, the compressor power for various quantities of water for a given condenser, and the total power required for both pump and compressor at various conditions

well drillers are equipped for and skilled in those types of operations.

Assuming that the conditions to this point are favorable to the use of well water—and that ground or space can be found for drilling the well—we are still faced with the problem of what to do with the water once it has been used. Such quantities of water cannot often be disposed of in sanitary sewers, because it would overload the sewer system or the sewage treatment plant. In some special cases adjacent creeks, washes, and the like may offer a solution. In other cases the water may be used for irrigation. . . . But these are all special cases not very generally applicable.

How Dispose of the Water?

In many cities the water may be disposed of by running it into the storm drain system, for even large quantities from the sources under consideration do not noticeably impair the capacity of the storm drain, and in fact may be regarded as beneficial to the storm drain in tending to keep it clear of the dust and dirt which accumulate in dry weather. Some cities permit free use of storm drains for such purposes, while others make a small charge for this use of the storm drains.

There still remains the possibility of depletion of the underground water supply, which may be objectionable especially when the use of air conditioning becomes as general as it has in many areas.

Disposal wells answer most of these questions, but now we have added another unknown factor. Another well involves more study, prediction, and evaluation. We must consider the following questions:

1) Is there a pronounced lateral flow?

2) If use is made of this lateral flow, how will it affect the next property downstream? (If well water is being used there for a similar purpose.)

3) What is the rate of lateral flow?

4) What is the depth of the water-bearing stratum?

5) How much water does it actually hold?

6) What is the thermal capacity of the water-bearing stratum?

7) Are there two or more water-bearing strata?

If the water is originally obtained from a deep well which goes to a deep-lying water stratum, it is quite possible that it may be disposed of in a shallow surface stratum or some porous ground above the water-impervious stratum overlying that from which the water was obtained. (This is an unusual case but not an impossible one).

Lateral Flow From Well

When lateral flow is depended upon for carrying the water away from the disposal well, the disposal well should of course be located downstream from the supply well.

Allen Hazen evaluates the rate of lateral flow in sand or gravel as

$$V = Cd^2\frac{h}{V}$$

where V is velocity in feet per second; C is a constant (while C must be determined experimentally for exact determinations, the value is usually about 0.30); d is effective size of sand grains in millimeters; and h/V is line of the angle or slope of the hydraulic gradient.

The above is at best an approximation. In the case of fine sand, the flow will tend to vary directly as d instead of d^2.

We must also consider the fact that the drawdown of the supply well and the buildup of the disposal well may reverse the hydraulic gradient locally if the wells are too small or too close together, but even so, the general mass flow persists.

It is possible, where the water-bearing stratum is close to the surface but quite deep itself, to stratify the two temperatures of water by obtaining the water from considerable depth and returning it to a higher level. (In the case of water which is discarded colder than the supply, such as is the case when heating with a reversible cycle refrigeration system, the condition should be reversed.)

[The author has been connected with a number of such projects which have been quite successful. In one case, 2000 gpm is pumped from two supply wells, 150 ft deep (one 10 in. and one 16 in.) with a temperature rise of 7 F and disposed of in a well 24 in. by 80 ft deep within the same city block. No rise in temperature has been experienced from backflow or mixing during more than a decade of operation.

Care should be taken not to perforate the disposal well above the normal water level, nor to perforate the supply well above the level of the bottom of the disposal well. The two wells may be combined into one.

Where the wells are to be used for both heating and cooling with a reversible cycle system the problem is somewhat more complex, but the same general principles apply.

DOES ST. LOUIS SMOKE LAW WORK?

"Low Volatile" Smoke Ordinance Does Not Solve Problem

By H. B. Lammers
Director of Engineering, Coal Producers Committee for Smoke Abatement

WHILE THE DEMAND for smoke abatement in hundreds of cities throughout the country continues apace, and very properly so, there has been a definite shift in the layman's thinking as to the most effective solution to that problem, H. B. Lammers, director of engineering for the Coal Producers Committee for Smoke Abatement, told a group of operators in Cincinnati last month.

"For several years many laymen over the country have assumed that the problem could only be solved by passing what has become known as a St. Louis type of ordinance. The basis of such ordinances is that only coals containing 23 percent of volatile matter, or less (or some other arbitrarily selected percentage), be permitted to be burned in hand fired equipment", Mr. Lammers said.

"St. Louis obtained a tremendous amount of publicity by claiming that such an ordinance had 'eliminated' smoke in the Missouri metropolis; indeed, that it had wrought a 'miracle'. During the last several months, however, even during the summer months when hand fired equipment was not in use, atmospheric conditions have been so bad in St. Louis that even the St. Louis newspapers—which formerly insisted the ordinance had performed a 'miracle'—are now crying for an appropriation of $16,000 in order to study the causes of St. Louis air pollution, which has been described as 'rotten' by an officer of the St. Louis smoke department. So even the newspapers and people of St. Louis itself are realizing that a 'low volatile' ordinance does not, and cannot, hold the answer", Mr. Lammers stated.

"The layman is also finding out that 'low volatile' ordinances cannot solve the problem because he has become convinced that there simply is not enough low volatile coal to go around, even if its enforced use could eliminate smoke, which it cannot do", Mr. Lammers continued, "and one city which passed a 'low volatile' ordinance several months ago is reported to be on the verge of declaring an 'emergency'. Another city which passed a 'St. Louis' type ordinance has suspended operation of the 'low volatile' provision until October 1, 1949."

[*Concluded on next page*]

St. Louis Leads Country With Its Smoke Law

By Raymond R. Tucker
Former Smoke Commissioner
City of St. Louis

MY ATTENTION has been called to the accompanying news release from the Coal Producers Committee for Smoke Abatement. The statements contained therein merit a reply.

As one reads this release, he is led to believe that the St. Louis smoke elimination program has failed. This—I am happy to say—is not true.

The subject of air pollution is very broad and complex. The atmospheric air is polluted not only by smoke, which is finely divided particles of carbon, but by many other solid particles—such as chemical dust, metallic dust, wood dust, dust from textile plants, sand rock dust, coal dust, grease, paint particles, fly ash, cinders, etc. In addition there are many obnoxious and noxious fumes. The existence of all these atmospheric contaminants must be recognized.

The use of low volatile fuel in hand fired equipment during the winter months has not eliminated the chemical dust, metallic dust, etc. However, the use of low volatile fuel in hand fired equipment in the winter months has eliminated the smoke, which is only one element of atmospheric pollution.

The request for an appropriation of $16,000 was not instigated by any dissatisfaction over the smoke program, but with the elimination of smoke these other atmospheric contaminants became more noticeable. The object of the survey suggested was to determine the source and magnitude of these other airborne particles. Preliminary surveys indicated that the fly ash content of the atmosphere was between 10 and 18 percent of the total dust, and of this percentage one plant alone, which burns high volatile fuel, admitted responsibility for 6 percent. This plant is installing the proper equipment and the discharge will be materially reduced.

The low volatile fuel did not contribute to the fly ash nuisance, nor did it contribute to the other dust nuisances; it did make a major contribution to the elimination of smoke.

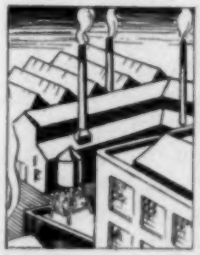
One becomes more or less weary of the repeated attempts of certain high volatile interests to tear down the work that has been done in St. Louis. St. Louis

[*Concluded on next page*]

NO—

[*Concluded from preceding page*]

Mr. Lammers explained that there are several reasons why low volatile coal is especially short at this time. The steel industries are running at full capacity, and low volatile coal is necessary to them for coke making. In addition, there has been a considerable drop in tonnage of this type of coal because one large coal company has not produced any coal since June 29, 1947, because it refuses to pay 10c a ton into the mine workers welfare fund, unless, it is said, the money is allocated to that company's own miners and their families. The Black Diamond, coal trade magazine, reports that there is a well-defined rumor that a steel company has been considering the purchase of the property, and if that happens, the mines would become "captive" mines, all of this tonnage would be used in the steel mills, and the low volatile tonnage from the mine would not be available for heating use, according to Mr. Lammers.



"It is for these reasons," Mr. Lammers concluded, "that many cities are finally realizing that the 'low volatile' approach cannot solve the smoke problem, and that it is not a feasible approach even if it were an adequately effective one theoretically, because sufficient low volatile coal is just not available for hand fired heating equipment. In other words, many cities are finding out that there is no 'miracle' solution to the air pollution problem, and they are finding it out the hard way. As the Coal Producers Committee for Smoke Abatement has consistently maintained, the only possible solution is by an engineering approach and lots of hard work, over a period of time, in cleaning up individual sources of pollution."

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NATIONAL and international attention has been given to the smoke elimination program of St. Louis, a key feature of which prohibits the burning of high volatile coal in hand fired plants. In an address last month before a group of coal operators, H. B. Lammers, director of engineering of the Coal Producers Committee for Smoke Abatement, said that a "low volatile" ordinance of the St. Louis type does not and cannot hold the answer to the important problem of smoke abatement. Raymond R. Tucker, former smoke commissioner of St. Louis, and now professor and head of the department of mechanical engineering at Washington University of that city, disagrees entirely with him. A complete discussion of the provisions and background of the St. Louis program was given in a series of articles by Professor Tucker published in HPAC from September 1945 to February 1946.

●

YES—

[*Concluded from preceding page*]

fortunately, has ignored these attempts, and at present is going forward to further improve atmospheric conditions. Ordinances have been presented to the board of aldermen attacking the other sources of contamination. One ordinance will place the responsibility of eliminating all dust and fumes not created by the burning of the fuel, in the hands of the health department. This is done because their powers are very comprehensive. Another ordinance has been presented to amend the standards in the smoke ordinance on the elimination of fly ash. The present standards in the ordinance were established in 1939 and are admittedly obsolete.

The other question which has to do with the St. Louis smoke ordinance may very well be answered by a quotation from an article which I wrote for the February 1946 issue of Heating, Piping & Air Conditioning:

"It has been stated by those who oppose the St. Louis program that if all communities accepted this method, there would be insufficient low volatile coal to satisfy the demands. This argument, of course, is fallacious, and if it were true and carried to its logical conclusion, new discoveries, devices, or principles would not be used until there was a supply sufficient to meet the demand. The beneficial effects of penicillin would have been lost for years, and the sulfa drugs could not have been used in the treatment of many cases if we awaited the time until the supplies were adequate.

"There are ample reserves at present of low volatile fuel. It is estimated in a paper identified as I.C. No. 7261, printed by the U. S. Department of Interior, November 1943, that the present low volatile fuels, if consumed at the same rate as in 1941, would last 366 years. The field itself, according to the same source of information, is only 5 percent exhausted. W. E. E. Koepler, Secretary of the Pocahontas Operators Association, in a paper on Selection and Availability of Low Volatile Fuels which was delivered before a Cleveland engineering society on October 29, 1945, said 'It is estimated that 177,700,000 tons of low and medium volatile fuels are available each year.' This includes coke, briquettes, etc. He further argued that over 50 percent of this tonnage is fuel especially prepared for the domestic market. If this is true, there is then available approximately 88,000,000 tons for domestic consumers. He further stated that the retail domestic market of the bituminous coal industry is estimated at about 20 percent of the total; this would result in the domestic trade consuming approximately 120,000,000 tons per year. This tonnage includes a large proportion of stoker coal. Under these conditions it would appear that there is sufficient low volatile fuel for all, and if there is not, high volatile fuel should be processed."

* * * * *

St. Louis has led the country in enacting laws for the elimination of smoke which have been constructive and have produced the results desired. St. Louis will continue its work in combating atmospheric pollution despite any ill-conceived and ill-considered statements which are made.

How to Figure
MOISTURE IN COMPRESSED AIR

If it might be industrially practicable to compress air isothermally [without change of temperature], the moisture content of the air would not be any serious problem. However, this type of compression could only be accomplished in laboratories and test plants. Air compressed adiabatically [in which the temperature during compression rises unchecked], as in standard commercial practice, should be cooled so as to reduce its moisture carrying capacity at some desired reservoir pressure and temperature. This cooling should be accomplished between the discharge at the compressor and the reservoirs or accumulators, so as to provide easy means for precipitating and draining off the extracted moisture.

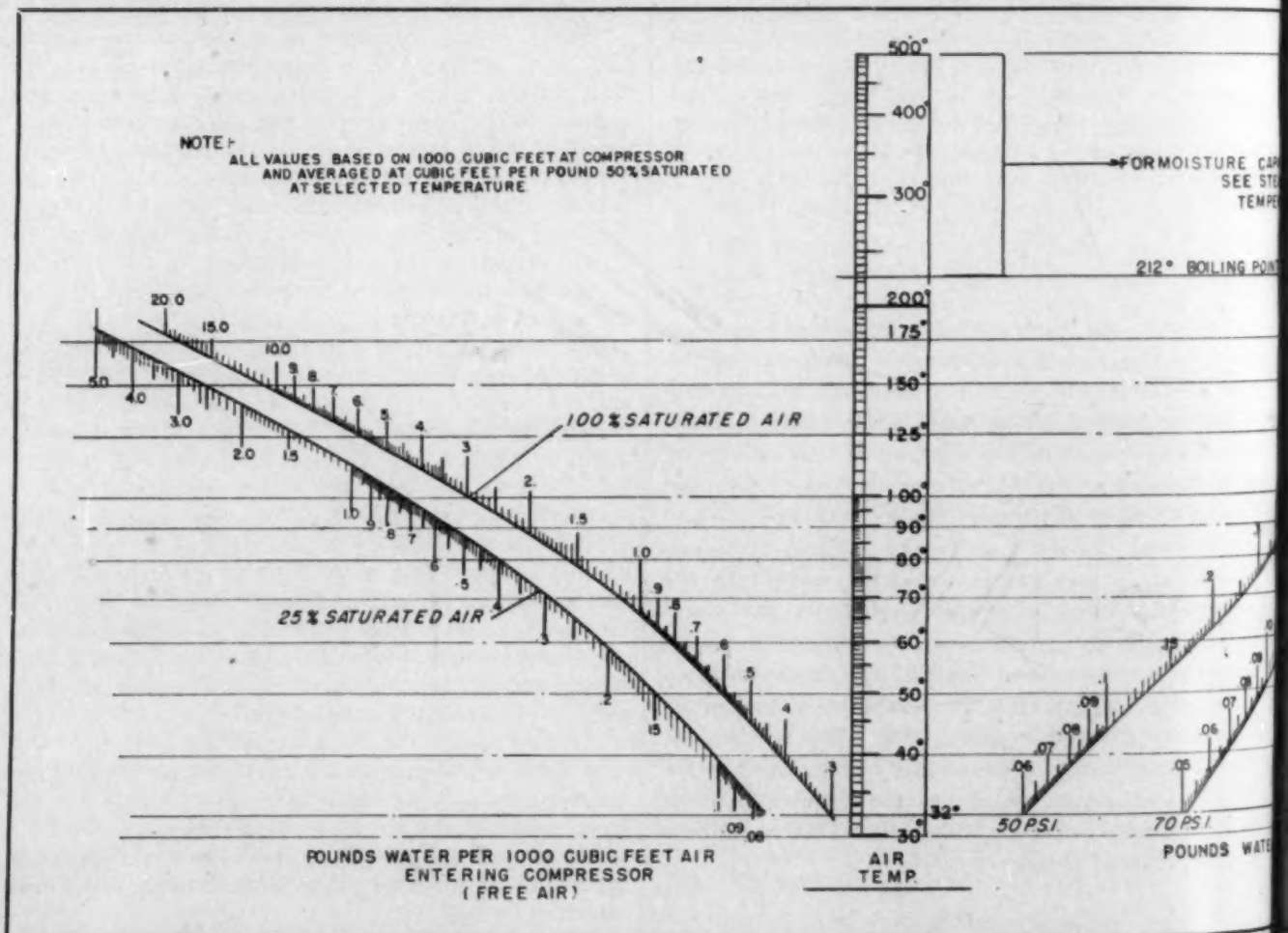
The problem of water in compressed air which has not been precooled is a serious one in the functioning of most types of air tools and air operated machinery. This problem becomes far more serious, however, in railway locomotive and car brake equipment where intermediate cooling between compression stages is nonexistent or, due to space limitations, ineffective. In such cases, it is not only water traveling with the hot air as a vapor which causes trouble when eventually cooled and precipitated in the system; oil vapors are also carried and precipitated at needed delicate control valves, with embarrassing and sometimes serious results.

All of the above is more or less axiomatic and well known to engineers concerned with the design and operation of compressed air machinery. But technical calculations involving the many variables which must be met have not been too well worked out for practical application.

Moisture Chart Simplifies Calculations

A moisture chart is presented which was developed to simplify calculations with respect to determining advantages of cooling compressed air in the reservoirs, and to determine sufficient cooling medium to accomplish a desired result.

A study of this chart, with entering air conditions to the left, temperature scale in the center, and various reservoir pressure values to the right, will disclose that precooling between the compressor discharge and reservoir or acccumulator connections is desirable. Temperature of air discharged from the


NOTE:
ALL VALUES BASED ON 1000 CUBIC FEET AT COMPRESSOR AND AVERAGED AT CUBIC FEET PER POUND 50% SATURATED AT SELECTED TEMPERATURE
100% SATURATED AIR
25% SATURATED AIR
212° BOILING POINT
50 P.S.I.
70 P.S.I.
POUNDS WATER PER 1000 CUBIC FEET AIR ENTERING COMPRESSOR (FREE AIR)
AIR TEMP.
POUNDS WATE

compressor approaches 250 to 300 F, sometimes higher, and at these temperatures moisture extraction is nil, within the limits of the water vapor compressibility rate.

This chart further discloses the advisability of cooling the air compressor discharge into the reservoir to as close to the initial entering air as is practical and expedient. This assures the maximum moisture extraction for a given reservoir pressure. It should be noted that reservoir values about 175 F are not plotted to accuracy of slope.

The decrease of volumes or loss of volumetric efficiency, due to precooling between the compressor and reservoir, are small and easily offset by the lesser maintenance costs and possible hazards.

Sufficient cooling surface to bring the compressed air temperature between the compressor discharge and reservoir as close as possible to the initial or ambient temperature is desirable at all times. Space limitations many times make it necessary to allow the reservoir temperature to rise several degrees above the

L. F. WILSON, president of the Wilson Engineering Corp., presents a chart for determining the amount of moisture in compressed air. Water in compressed air presents a serious problem in the functioning of air tools, air operated machinery, and railway locomotive and car braking equipment.

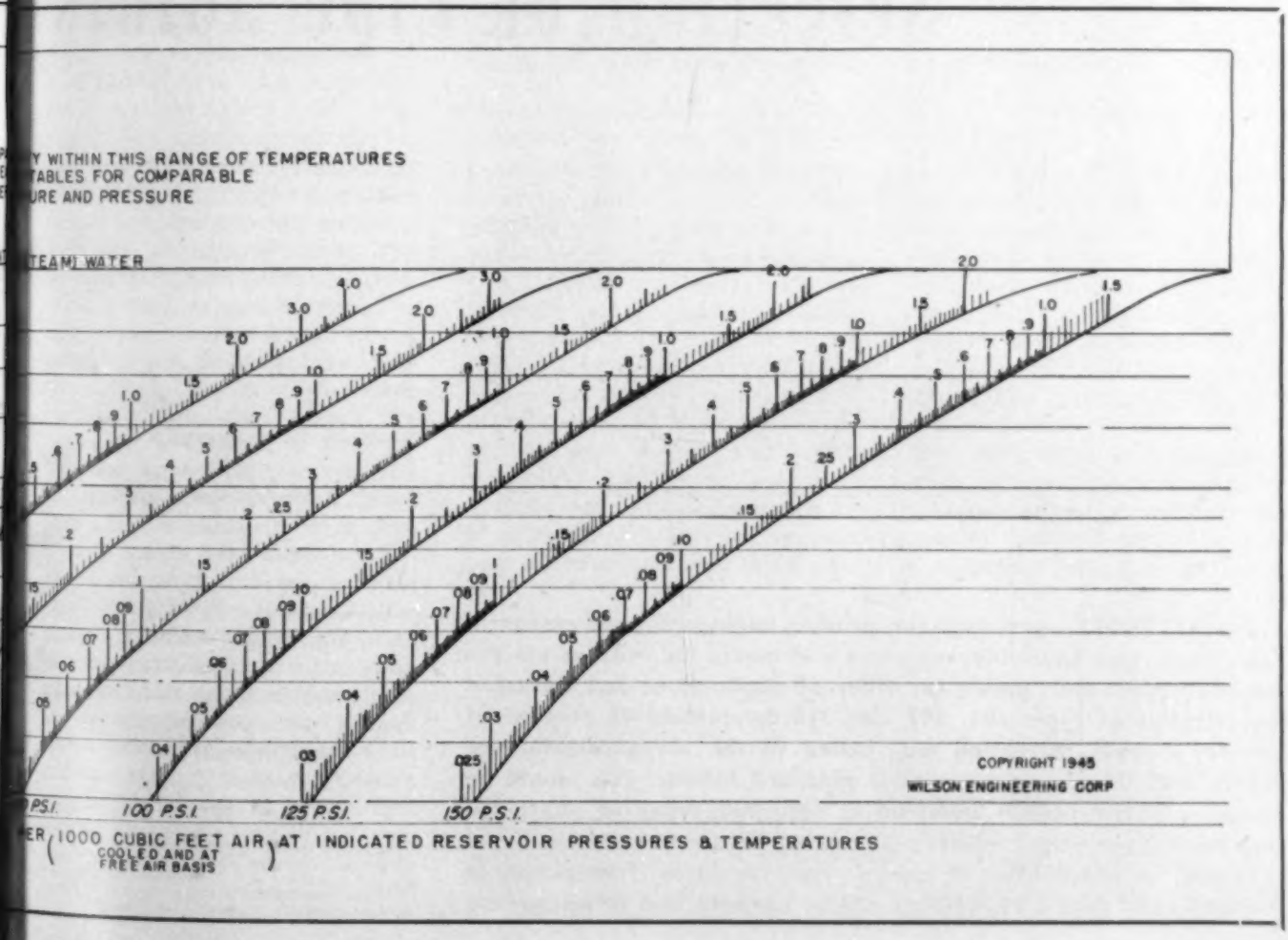
ambient entering air temperature to the air compressor intake.

Example of Use of Chart

As an example of the use of the chart, assume an extreme condition of atmospheric air; 100 percent saturation at an atmospheric temperature of 100 F. Under this condition, the atmospheric air will carry 3 lb of water per 1000 cu ft. Following the scale across the chart, it will be found that after compression cooling back to 100 F, there will be left 0.25 lb of water unprecipitated at 150 psi. The difference is represented in the water precipitated by the cooling effect.

However, since it would not be practicable commercially to cool the air down to atmospheric temperature, after compression, the scale for the compressed air must be read in the upper temperature ranges. Should we assume that the air would be cooled to 150 F, the remaining moisture would be 0.8 lb per 1000 cu ft at 150 psi, based on free air. The cooling effect in this case, therefore would precipitate 2.2 lb of water per 1000 cu ft.

Note: In reading this article there may be some confusion in the use of the term "precooling," as the term "aftercooling" is often used in the same relationship. The author uses the term precooling or primary cooling with reference to the reservoir or accumulator; that is, for the cooling effect on the air between the compressor and the reservoir or accumulator. The term aftercooling is sometimes used for radiation in the same location, but the term has reference to the compressor. Either term, may, therefore, be used, but it must be with understanding.


Y WITHIN THIS RANGE OF TEMPERATURES
TABLES FOR COMPARABLE
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COPYRIGHT 1945
WILSON ENGINEERING CORP
100 P.S.I.
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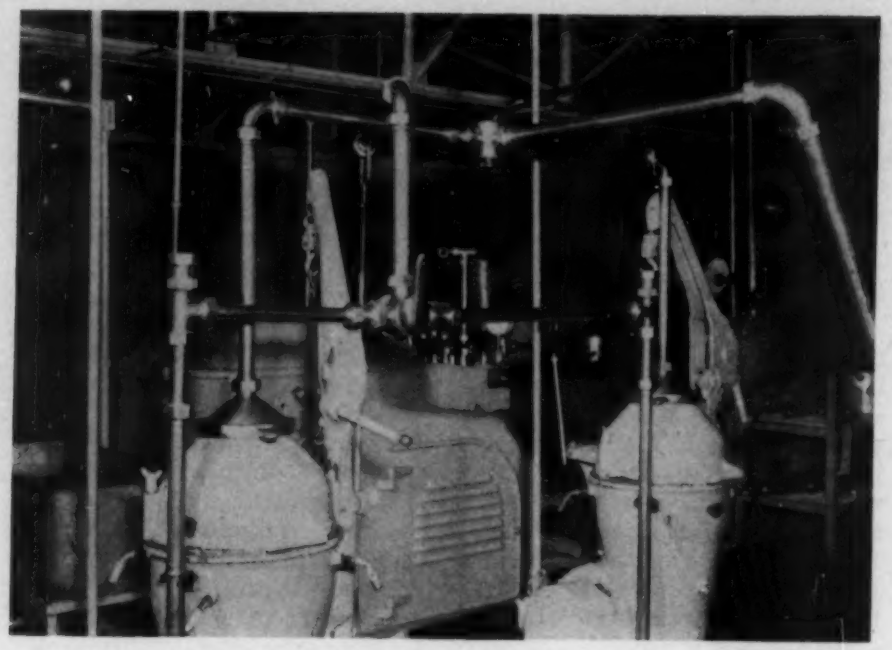
150 P.S.I.
ER (1000 CUBIC FEET AIR COOLED AND AT FREE AIR BASIS) AT INDICATED RESERVOIR PRESSURES & TEMPERATURES



Sanitary stainless piping is used in the Ewing Von Allmen Dairy Co. plant

STAINLESS STEEL PIPING
Selection of Pipe Joints

J. D. MATTIMORE, chief engineer, product engineering and research, Tube Turns, Inc., Louisville, reviewed last month the reasons for the use of stainless steel piping for different applications and discussed the selection of types 304, 347, and 316 as meeting 95 percent of industry's needs. Attention was called to the standardization of lighter wall thickness for stainless pipe and fittings. This month he discusses considerations involved in selecting types of joints for maintaining sanitary conditions, avoiding fluid contamination, and reducing the possibilities of crevice type corrosion. Fabrication of stainless steel piping by welding will be covered in a future article

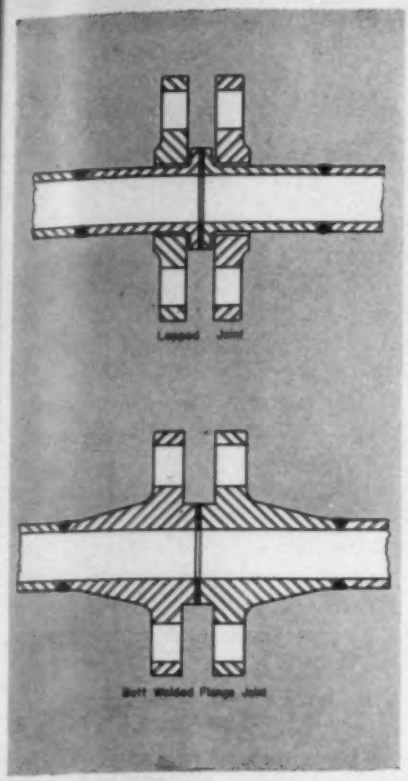
In discussing the application of stainless steels in last month's issue of HPAC, five general reasons for using stainless steel piping were listed. The majority of stainless steel piping is used for one or more of the following three reasons, namely; (1) handling foods or drugs in a sanitary manner, (2) avoiding contamination of the fluid handled, and (3) resisting corrosion. The uses of stainless piping at extremely high or low temperatures because of its excellent physical properties and for resistance to hydrogen penetration are important uses, but are not of large volume.

The ideal piping system obviously would be one in which no joints are necessary, thus eliminating all possibility of leakage and at the same time presenting to the fluid a perfectly smooth interior surface, completely free of pockets, crevices, or humps capable of trapping the fluid or disturbing its flow lines. With the limitations on length in which pipe or tubing is available and with the necessity of changing direction or regulating flow imposed on the piping designer, clearly a jointless system is impossible to attain. In most instances, the designer must therefore decide whether to use butt welding, socket welding*, or screwed or flanged fittings to make the assembly. These various types of pipe joints are shown in accompanying sketches.

Sanitary Requirements

In the case of systems intended to be kept *sanitary*, pockets or crevices on the interior of the piping must be avoided except at such points where they can be frequently and thoroughly inspected and sterilized. Both socket welded and male and female threaded joints are objectionable from this standpoint. In making the customary type of socket weld, there will always result a crevice between the pipe end and the bottom of the socket in the

* Socket welded joints in which both interior and exterior welds are made are considered equal to butt welds for the purpose of this discussion which does not touch upon the matter of relative strength.

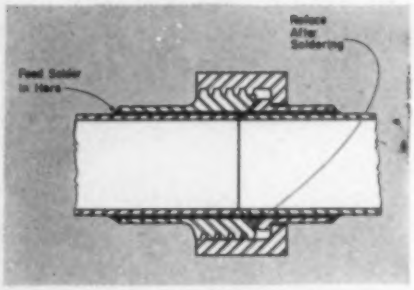


Flanged joints as shown here are used extensively in stainless piping systems

fitting, which will be a trap for the line fluid and which cannot be adequately inspected. Screwed joints are equally objectionable, unless each joint is completely disassembled for cleaning and inspection. Even then, the thorough examination of the female thread, particularly in the smaller sizes, becomes quite difficult. For these reasons, the general practice in such systems is to use piping connected with union fittings and unions, spaced 10 ft or less apart, the unions being slipped on the pipe end and soldered or brazed to it. This type of sanitary fitting is also shown in an accompanying sketch. The lines are disassembled frequently for sterilization and inspection. In dairies, this is generally done every day. Such piping systems are usually about 2 in. size with 4 in. being considered large. In the 4 in. and larger sizes, resort may be had to welding flange joints, (frequently of the lap joint type) with all welds being ground on the interior to present a smooth surface. In such all-welded systems, it is important that the welder secure full penetration in making the butt welds. If anything, excess penetration is to be preferred to incomplete penetration so that all small depressions, extending into the wall thickness of the pipe, are avoided.

Avoidance of Contamination

When stainless steel is used to avoid *contamination* of the product being handled, there are frequently two considerations involved. One is that the fluid must not pick up any metal from the pipe or any corrosion product resulting from its action on the pipe, at least to the extent that it affects the color, taste, or chemical properties of the fluid itself. The other consideration is that there frequently must be no crevices in the pipe interior where a portion of the fluid itself may lodge and "age". By "aging", in this instance, is meant a change in the chemical nature of the fluid, due to stagnation, which will ultimately affect the fresh fluid in contact with it. From both viewpoints, socket welded or screwed joints are undesirable. In the first instance, it may be said that almost every fluid has some power, even though very slight, to dissolve or otherwise corrode metal. If there are crevices in the metal where the fluid can lodge, it will pick up more of the metal due to its longer contact with it, than otherwise. Depending on the nature of the fluid and the



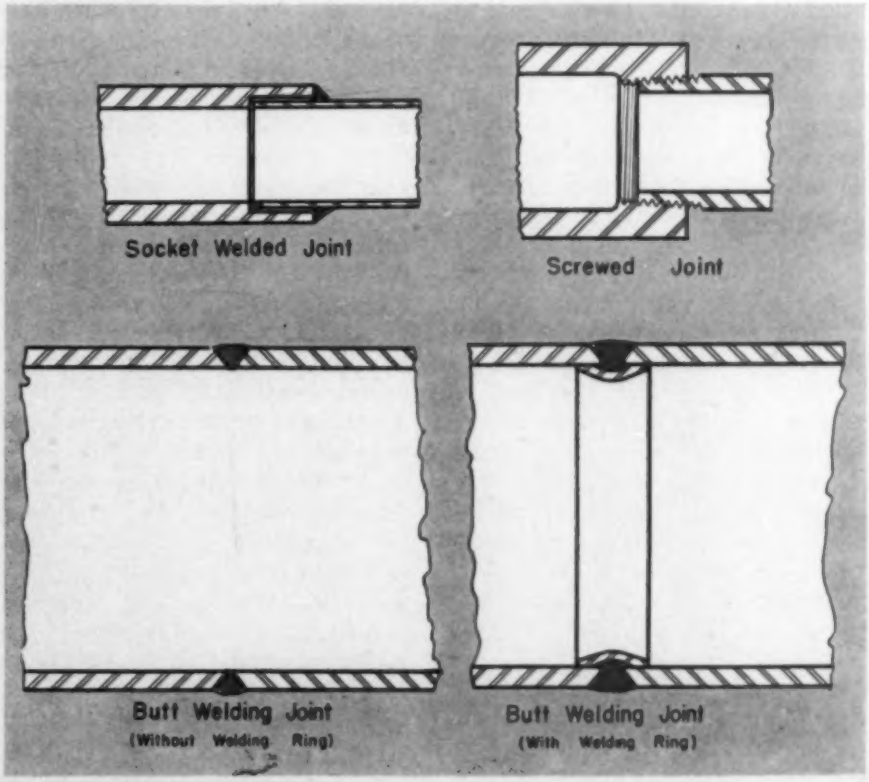
Ground joint unions soldered to stainless pipe provide sanitary joints

number of such crevices in the system, the fluid as a whole may be affected. When the fluid has "aging" properties, it is obvious that screwed or socket welded joints must be avoided. For this use of stainless steel, therefore, butt welded joints seem to be preferable. In some cases, flanged joints with flanges or lap joint stubs welded to the pipe (and the interior of such welds ground smooth) may be necessary. In the majority of cases a complete butt welded system, with care being taken to attain full penetration at the welds, should suffice.

Crevice Corrosion

In installations where stainless piping is used to combat severe *corrosion* the use of socket weld fittings or screwed joints with their

Types of screwed and welded pipe joints. Of these the butt welded joint, without a welding ring, is most suitable for stainless steel piping



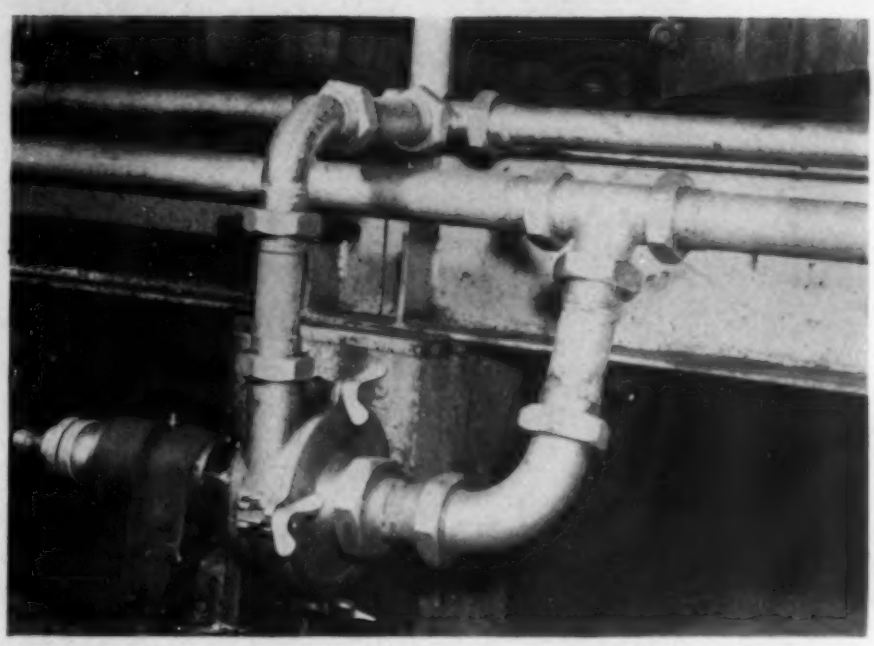
Stainless piping in dairies is frequently disassembled for sterilization and inspection, generally every day

attendant small pockets in which fluid can be trapped is definitely to be avoided. The primary reason is that most corrosion attack on metals is now generally believed to be electrochemical in nature, and the action takes place in the same general manner in which an electric current is generated in an automobile battery. The fluid in the pipe is the electrolyte of the battery and the poles of the battery are different parts of the piping system. The action is best understood in the case when two different metals, such as a brass fitting and a stainless pipe, are joined together. The two different metals in the presence of an electrolyte—any liquid capable of carrying an electric current—set up a small battery with the current flowing from the more noble metal, the cathode, to the less noble metal, the anode which is gradually dissolved and may eventually disappear. In the case of brass and stainless steel, the brass would be the anode and would be attacked by the corrodent. This is called *galvanic corrosion*.

When the same metal is used throughout the system, and when crevices in which the fluid can collect and concentrate in strength are present, a special form of such corrosion can take place. This is technically known as *concentration cell corrosion*, frequently called crevice type corrosion which usually results in pitting of the metal. The manner in which this takes place depends somewhat on the nature of the fluid and somewhat on the metal of which the piping is made. In the case of the more common corrosive fluids handled in stainless steel pipe it can be broadly sketched as follows, although in endeavoring to make the description clear the writer may be opening himself to the criticism of over-simplification. Stainless steel is thought to depend for its noncorrosive properties on its ability to form a highly resistant, microscopically thin film of chromium oxide on the surface exposed to attack. As this film is worn away or otherwise removed by the surrounding environment, the metal has the power to reform the film and thus resist rapid attack. It is essential, however, that sufficient oxygen be permitted to contact the metal surface so that the chromium oxide film may be reformed. Most fluids being handled in piping either contain oxygen as part of their chemical makeup or carry it in the form of air dissolved or trapped within it. Thus, the presence of oxygen in the liquid in adequate amounts to create the desired corrosion resistant film is usually assured.* When the fluid can enter crevices or cracks in the system and tend to concentrate there, a small amount of corrosion products, resulting from the action of the fluid on the metal, is formed. Being out of the main stream, this material settles or congregates in the bottom of the crevice. The oxygen in this stationary, porous material disappears by reaction with the metal in contact with it. In the region around this material the oxygen is renewed by the flow of liquid and a cell is set up with a low concentration of oxygen in the stationary material and a higher concentration of oxygen in its vicinity. The metal in contact with the higher concentration becomes the cathode and the metal in contact with the corrosion products in the crevice becomes the anode and begins to be attacked rapidly because it cannot adequately renew its protective oxide film. The longer the action goes on, the more efficiently does the stationary material prevent oxygen reaching the metal under it and the more accelerated will be the rate of corrosive attack. The result will eventually be a pitting through of the metal wall.

There is some evidence to indicate that when concentration cell corrosion takes place in stainless steel, it may proceed at an even faster rate than would be the case if the same conditions existed with carbon steel. For example, a pitting rate of 1 in. per year has been observed in stainless steel in contact with sea water when concentration cell conditions existed. Since barnacles form on carbon steel in sea water and represent a perfect type of concentration cell and since carbon steel under such conditions does not pit through as rapidly, it would seem that stainless steel may be more susceptible to this form of attack. Perhaps the explanation is that the high contents of nickel and chromium, found in stainless steel, act like dissimilar metals in contact,

* A very recent theory ascribes the corrosion resistance of stainless steel to its ability to absorb oxygen into its surface rather than to its formation of a protective chromium oxide film. Whatever may be the case, it is thought that the mechanism of concentration cell corrosion herein described still obtains.



Handling prune juice, as done at the Wheatley Mayonnaise Co., is but one of the many uses for stainless steel piping

causing galvanic corrosion and thus enhancing the rate of attack, when the chromium is starved of oxygen. In any event, it should be evident that socket welded and screwed joints with their attendant crevices must be avoided when stainless steel is used to provide corrosion resistance. Obviously a butt welded joint offers far less opportunity for concentration cells to form, particularly if care is taken by the welder to obtain full penetration. In specially severe cases it may be desirable to use flanged joints with the interior surfaces of all welds, attaching the flanges or lap joint stubs to the pipe, ground flush with the interior wall.

From what has been said, it should be clear that, in applying stainless steel piping to the handling of fluids under corrosive conditions, the use of welding or backing rings in making butt welds also is undesirable since they too form traps for the fluid passing through the system. On the other hand, there is no evidence that welding rings enhance the rate of corrosion attack in steam and water lines or in other services where corrosion is not a major problem.

FOR SAFETY—VENTILATION, HUMIDIFICATION, CONTROL

Because of the inherent importance of fire and safety protection in various phases of engineering and industry, the fire protection and safety engineering section of the Western Society of Engineers plans to issue information from time to time on this subject. The following case history of a condition in a cutting room of a lacquer plant emphasizes the need for proper protective measures:

Two men were working in a cutting room, physically separated from other parts of the plant. The outside temperature was 15 F below zero, and the room relative humidity was very low. A moistureproof lacquer was being prepared in a steam jacketed vessel with a hinged cover, the principal ingredient being naphtha having an ignition temperature of 450 to 500 F.

Cutting room floor was concrete, walls brick. Mixing tanks were mounted on steel supports with both permanent and removable motors. Outside vents located in ceiling. Three mixing tanks with agitators powered by ordinary induction motors were serviced by several portable steel tanks mounted on dollies. A number of ordinary steel hammers, chisels, wrenches, shovels, etc. were kept in room. Workers wore ordinary footwear.

Naphtha and ingredients were being heated in the steam jacketed vessel while workers went to other end of room to do another job. The mixture was heated to 125 F and continued to get hotter as the workers forgot the process was in operation. When the mixture boiled over, one of the men ran to the vessel to turn off the steam. As he reached the valve his body static drew a hot spark which ignited the boiling naphtha vapors.

The resulting explosion blew out all the windows, and fire ensued causing damage which disrupted production for several days. One worker died from the result of burns, and the other employee was hospitalized for many weeks.

The following safety measures if placed in effect prior to the above incident would have prevented the loss of life, property and disruption of production, according to the WSE's fire protection and safety engineering section.

1) Installation of a thermostatic control to shut off steam at the prescribed 125 F temperature.

2) Installation of steam jet humidifiers to maintain higher humidity and reduce the hazard of static electricity accumulation.

3) Installation of grounded flooring. Workers should have worn cotton socks, and shoes with electrically conductive soles.

4) Installation of exhaust ventilation at the floor level to prevent solvent vapor accumulation.

5) Electric grounding not over one ohm resistance for all tanks.

6) Fixed tanks with flexible grounding cable and clamp for attachment to vessels used to draw off flammable liquids, thus preventing accumulation of static charge generated by liquid agitation.

7) Replacement of the electric motors with explosionproof type.

8) Replacement of steel tools with nonsparking type.

It should be of interest to note that immediately under the steam vessel five drums of pyroxylin were in storage but due to the protection and action of an automatic sprinkler system this highly combustible hazard was not involved.

An electronic violin

What's New in ACOUSTICS?

By Vern O. Knudsen
University of California, Los Angeles
Past President, Acoustical Society of America

ADVANCEMENTS IN acoustics—as in other arts and sciences—often pose new problems in heating, piping, and air conditioning. One of these problems is as old as the pipe organ. In order to keep all parts of the organ in tune with each other, it is necessary that the chambers in which the pipes are housed, and the air which operates the pipes, be at approximately the same temperature—the temperature for which the organ has been tuned.

Another—and more serious—problem was thrust upon the air conditioning industry when sound took command of motion pictures. Soundproof studios lined with 2 in. or more of rock wool were, incidentally, also heatproof. They had to be quiet for good sound recording; they had to be cool to keep the make-up paint *in situ*, and to prevent temperamental screen artists from "blowing the roof." The artists demanded the cool air, which the air conditioning equipment furnished; the camera men demanded quiet, which the air conditioning equipment did not furnish. Sound filters in the ducts furnished the required solution to this problem, and now these filters are used in all installations where quiet is required.

Reverberation Affected by Humidity of Air

A third problem arose when it was discovered that the reverberation of high pitched sounds in a large auditorium is affected more by the humidity of the air (especially if the air is very dry) than by the materials which cover the interior walls and ceiling of the auditorium. This problem is pretty well solved by maintaining the relative humidity of the air at about 55 to 60 percent.

Although a scanning of the new horizons in acoustics does not reveal any immediately new or pressing problems for the heating, piping, and air conditioning industry, it does reveal tremendous activity in all branches of acoustics. For example, in the March 1947 issue of the Journal of the Acoustical Society of America, Arthur Taber Jones compiled a reference to contemporary papers on acoustics which contains 375 entries; 13 papers deal with architectural acoustics; 76 with the ear and hearing; 88 deal with applied acoustics, including five papers on the insulation or measurement of vibration; 10 papers are concerned with noise; and so on.

There were 78 papers on the program of the Acoustical Society of America at its spring meeting in New York this year. Highlighting this program was a symposium on musical acoustics, which continued through four sessions and included 20 papers dealing with diverse subjects. Of special interest, and possibly marking an important landmark in the evolution of music, was a demonstration of electronic musical instruments, in which an ensemble of hurriedly assembled musicians, conducted by P. B. Oncley of the Bell Telephone Laboratories, presented a concert including the Concerto Grosso No. 8 ("Christmas Concerto") by Corelli, William Shuman's Newsreel in Five Shots, and Gershwin's Rhapsody in Blue. Although these compositions performed with electronic instruments aroused the ire of several music critics, and the music thus rendered did not always fall "sweetly and gently" on this writer's ears, the concert revealed that there is a rich storehouse of musical resources in the modern developments of acoustics and electronics.

Acousticians Are Invading Music

It is 2500 years since music gave birth to acoustics in the primitive experiments of Pythagoras with the monochord. The active interest in acoustics today indicates that the child was not stillborn, and it seems safe to predict that it will give ample rewards for the mother's travail. Indeed, the recent symposium on musical acoustics indicates that acousticians are paying their debt to music, for they have launched a "friendly" but mighty invasion of music.

Even in the years immediately before World War II, acoustics scored two triumphal advances in its present invasion of music, one by Professor F. A. Saunders of Harvard University, and the other by Dr. Harvey Fletcher and his associates of the Bell Telephone Laboratories. Saunders' laboratory tests revealed that, at least to a physicist, good copies of famous violins and cellos—the copies costing about $500 each—could not be distinguished from the rare and costly originals, and he ventured to submit his conclusions to a competent jury of musical listeners.

To this end, the string quartet of

THIS REVIEW doesn't have anything to do with such practical matters as heating, piping, and air conditioning, says Dr. Knudsen, but we think that most of our readers will find it instructive—and good reading—just the same. Acoustical problems are certainly among those faced by heating, piping, and air conditioning engineers and contractors—sometimes most unpleasantly! If the author's remarks don't help you to meet any situations that come up in business, they certainly are of interest to all who play or listen to music (and who doesn't?)

the Curtis Institute of Music played the familiar andante movement of the Tschaikovsky string quartet before eight concert audiences, once with their famous originals and once with the carefully made copies of these instruments. The players were concealed by a screen that did not obstruct the sound. It was a challenging "which is which" type of performance in which the audience was requested to vote (secretly) its preference for the first or second playing. Although the order of playing (on the originals or the copies) was determined by tossing a coin, the audience preponderantly preferred the second playing, whether this rendition was with the originals or the copies. An elemental psychological factor, unsuspected by most people, was more significant than the composite difference between $150,000 worth of old masters and $2000 worth of good facsimiles.

A second triumph of acoustics in music occurred in 1941, when Dr. Fletcher, at a meeting of the Acoustical Society in Rochester, N. Y., demonstrated that stereophonic reproduction of music could be so nearly like the original that neither musicians nor acousticians could determine by listening which was which. Many persons in that distinguished audience were convinced that they actually could distinguish the real McCoy from the imitator. Half of these persons were right, *but the other half were wrong*—and that result satisfied the scientists and engineers that the dawn of high quality reproduced music was at hand.

The Stradivarius has lost none of its beauty of tone by the researches of Saunders. His findings mean that equally good violins now can be furnished nearly all violinists. And Fletcher's demonstration at Rochester augurs well for the reproduced music of the future: the only reason the music we hear in many motion picture theaters deserves the familiar epithets of "canned" or "tinny" is that obsolete equipment is used both for recording of the music in the studios and for reproducing it in the theaters.

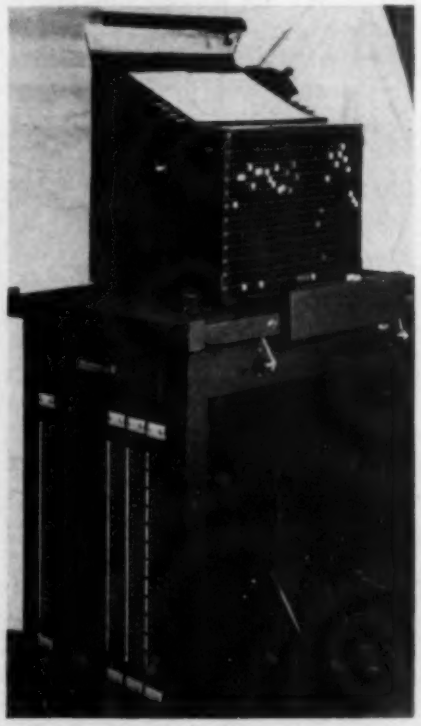
These iconoclastic invasions of acoustics in our most cherished art are real and powerful. There were those who, 20 years ago, threw their puny weight against the onrushing tide of the "talkies," hurling such names as "squawkies" at this new invention, and insisting that the art of the screen would be ruined by adding sound to sight. Verily—and often sadly—they have received their reward!

We have to accept modern acoustics in music whether we like it or not; with proper guidance and cooperation from music, modern acoustics can be as helpful as any influence that has ever contributed to music.

Standardized Scales for Loudness

There is one development in acoustics that has become so useful and standardized as to make its adoption in music almost imperative: standardized scales for the rating and measurement of loudness or loudness level. In the conventional musical notation, the pitch of a tone is quantitatively and uniquely indicated by the position of a note on the musical staff; the loudness level of the tone is left in a state of considerable uncertainty, with only a few qualitative gradations from triple pianissimo to triple fortissimo.

Control console for the demonstration of electronic musical instruments at the spring meeting of the Acoustical Society of America



How much better it would be to use the numerical scale acousticians now use in sound level meters. Instead of the vague ppp to fff, we should use, say, 35, 40, 45, 50 phons, and so on, in steps of 5 phons (or even smaller steps), up to possibly 120 phons. Instead of the indefinite crescendo, we should use a definite, specified increase in loudness level, say 45-60 phons or 50-90 phons. It would be easy either for beginning students of music or for experienced musicians to become familiar with this standardized scale. For the electronic musical instruments of the future there would be, of course, the controls for producing the loudness gradations the composer wanted and tried to specify with the inadequate symbols at his command. Conductors, soloists, or sound engineers in the control room—even now, and especially when our standard loudness level scale is used in the printing of music—could make good use of sound level meters to reveal to them the loudness level of the music reaching an audience.

Composers, conductors, and other musicians certainly should know the elementary facts about auditory masking. Many notes are written into music that are completely masked in even the best renditions of that music. On many occasions the present writer has witnessed the masking of a whole section of violins for several measures at a stretch. Except for the spectacle of their futile efforts, these violinists might as well have taken catnaps. If the composer had been guided by a knowledge of auditory masking, and had used the loudness level scale just proposed, and if the conductor and musicians also under-

stood and used this loudness level scale, there would be no such wastage; every tone would then contribute its full value.

What About Phonograph Records?

At the symposium on musical acoustics, musicians and acousticians alike heaped scorn upon the manufacturers of phonograph records. Although the sale of records is at an all time high—sales for the past year were reported to be four times as large as those for the preceding year, which itself was a record high—it was generally agreed that the quality of phonograph records has retrogressed during the past eight years.

This dismal conclusion is borne out by the writer's experience, who has stopped collecting records until better records are made. The last two albums of musical comedies he purchased were recorded so poorly that most of the words of the songs could not be recognized, and the "center" holes in all these records, and in most other records the writer has purchased during recent years, are so far off center that the resulting "wow" when the record is played on a high quality phonograph is well-nigh intolerable.

There is one ray of hope for the future: some of the larger and better makers of records, together with the Institute of Radio Engineers, the Society of Motion Picture Engineers, and the Acoustical Society of America, are cooperating with the American Standards Association in the setting up of performance as well as dimensional standards in the field of sound recording to meet the needs of this rapidly growing art, as applied to magnetic tape recording (which is developing at an almost explosive rate) and also phonograph records. It is high time that the recent advances in high quality recording and reproducing of sound be passed on to the public. Adequate standards will not alone reach the goal but they are a necessary advance toward the goal.

Space does not allow a review of the many other papers concerned with musical acoustics presented at the meeting of the Acoustical Society.

* * * * *

In conclusion, just what has the foregoing to do with the problems of heating, piping, air conditioning? So far as the writer knows, it hasn't anything to do with such practical matters, but he believes it is significant to all who are interested in music and acoustics, and that everyone who aspires to live by more than bread alone should cultivate such interests.

Stop Building Heat Leaks to SAVE FUEL THIS WINTER

WHILE THE OPERATION of the boilers for space heating is extremely important, as was brought out in Kalman Steiner's excellent article in the October HPAC, my experience has indicated that the greater waste comes from poor construction (which frequently can be remedied), and careless operation and maintenance of the building. As an illustration of the latter, I remember (when we were putting on a campaign for fuel economy in one of our large office buildings) that an examination of the elevator penthouse revealed that two windows had sizable holes in the glass that had not been replaced; a steel plate door leading to the room was badly warped; and the gravity ventilator dampers were wide open. Because of the stack action in the high building, I estimated that these openings were pouring out 1800 cfm of good heated air at 20 deg above zero outside.

Repairs were made to the door and windows, and automatic dampers put in the gravity ventilators, set to close one-half at 45 F and full at 25 F. There was enough leakage at the latter figure to permit ample ventilation of the penthouse. The savings the first winter were more than enough to pay for the improvements.

Stopping Heat Leak Due to Poor Sash

In another case, a large building about 35 years old, with a 155 ft north frontage, revealed windows leaking badly. Evidently, in a "penny-wise" design for economy, the sash in these windows were made 1¾ in. thick, when they should have been 2¼ in. thick, and it appeared that the sash were none too dry when installed and weatherstripped. The result was that the sash had warped and shrunk, and the weatherstripping was not doing half its job. In addition to this, the frames had not been properly calked and insulated, resulting in a considerable infiltration around the frame at almost every window.

Stopping this bad leak was something of a major job. We put in all new sash of carefully kiln-dried pine, and while we could not increase the thickness without putting in new frames, we did increase their stability by making the new sash frames 1 in. wider than the old. New weatherstripping was then installed. The leaks in the frames were stopped by new calking, removing the casing and packing the open spaces around the frames and under the stool with rock wool.

According to my estimates, the cost of this improvement would be paid for in 10 years. While normal-

ly we would not put in a steam saving device unless it could be paid for from savings in three to five years, in this case the improvement in the comfortable use of the space alone was worth the cost.

Check These Points for Economy

A summary of points to check for economy in space heating might be of interest:

1) *Overheating*—I, and all of my numerous relatives, could live in luxury if I could capture the price of overheating large buildings in an average city of 100,000 population situated north of the Mason-Dixon line. Seventy-four degrees without artificial humidity is warm enough for anybody. If you haven't the controls to hold it to that figure, better get some.

2) *Reduced Temperatures*—When space is unoccupied eight hours or more at one time, reduce temperatures 10 deg. If steam is purchased, shut off at a specified time each night until temperatures are down to 64 F. If steam is made on the premises, bank the fires as soon as the building is vacated. Set up a definite schedule for turning steam on and off, calibrated to the outside temperatures.

3) *Leaks*—Check building for leaks, night and day.

4) *Insulation*—Many masonry buildings built before 1925 have no insulation in the roof or ceiling of the top story. Proper insulation of the roof or ceiling will usually pay its cost in heat savings in two to three years.

5) *Lock Windows*—Have the cleaning force (or others available) lock *tight* all checkrail windows the first thing upon entering the space. If the cleaning force does not come to work soon after the regular occupants leave, assign the job to someone who can attend to it faithfully in the winter.

6) *Controls*—There are some wonderful controls and helpful gadgets on the market today. If existing controls do not do the job, it may pay to put in new. On any building over 100,000 cu ft in size, good controls will definitely pay for themselves.

EPH. A. TYLER, manager of the building department of the First Service Corp., Minneapolis, and a member of HPAC's board of consulting and contributing editors, has had a wide experience in practically all phases of building planning, design, construction, and supervision. His experience has indicated that the waste of heating steam or fuel due to poor construction and careless operation and maintenance of buildings is what must be stopped to achieve heating economy. His suggestions in this article are most timely, because of the tight fuel situation—for fuel conservation by means of improved operation is about the only way the individual plant or building can beat the problem of restricted fuel supplies

They need more careful maintenance than does most machinery. The control system should definitely be tuned up before the heating season and maintained in perfect working order. A resistance thermometer with one or more bulbs on each floor, with dials set up where the chief and night man can see them without getting cricks in their necks, is one of the most helpful gadgets. With this instrument, space thermometers can be checked at one or two hour intervals and recorded for the boss to look over and see how the boys are doing.

7) *Balance Radiation*—A few spaces in a large building with insufficient radiation will waste as much as 10 percent or more of the total steam consumption. Check all areas with a portable recording thermometer and adjust radiation so that temperatures are substantially equal in the entire building. Where overheated areas are found, it is cheaper to orifice than to cut down radiators.

How Much Steam for Heating?

For an office building with average occupancy, if steam consumption is less than 0.4 lb per thousand cubic feet per degree day, you are down to bedrock. If under 0.5 lb, you are good; if under, 0.6 lb you are just so-so. If consumption is over 0.7 lb, somebody better start raising the dickens.

Every type of occupancy has a steam consumption norm. If your building association or trade association cannot furnish this figure, perhaps you could benefit by checking your steam consumption with your competitors. This should be done on the basis of steam consumption per thousand cubic feet of building volume per degree day, or pounds of 14,000 Btu coal per thousand cubic feet per degree day.

READING, 'RITING, 'RITHMETIC & COMBUSTION

An excellent opportunity to contribute to the layman's knowledge of fuel combustion and equipment, and to demonstrate the cooperation of Coal Heating Service of Greater Detroit with city authorities in smoke abatement, is represented in an unusual educational project now in progress, according to Carl Schumacher, chairman of the group's educational committee.

For some time, the assistant superintendent of public schools in Detroit, Dr. Paul T. Rankin, has urged that the normal curriculum of the student be enlarged to include instruction in the everyday pursuits of the average man and woman. One of the subjects he believes to be of first importance for boys is a basic knowledge of correct combustion and the characteristics of fuels and fuel burning equipment.

Though the plans are not entirely completed, the tentative outline includes practical demonstrations "on location" as well as classroom theory. Pupils will actually be taken down into the boiler rooms of the public schools to observe the operation of heating equipment and systems. They will see automatic stokers in operation and in some instances hand firing. Emphasis will be placed on operation and maintenance.

Practical Pointers on

AIR CONDITIONING PLANT OPERATION

By Donald A. Kepler, Chief Engineer, New York Stock Exchange Building Co.

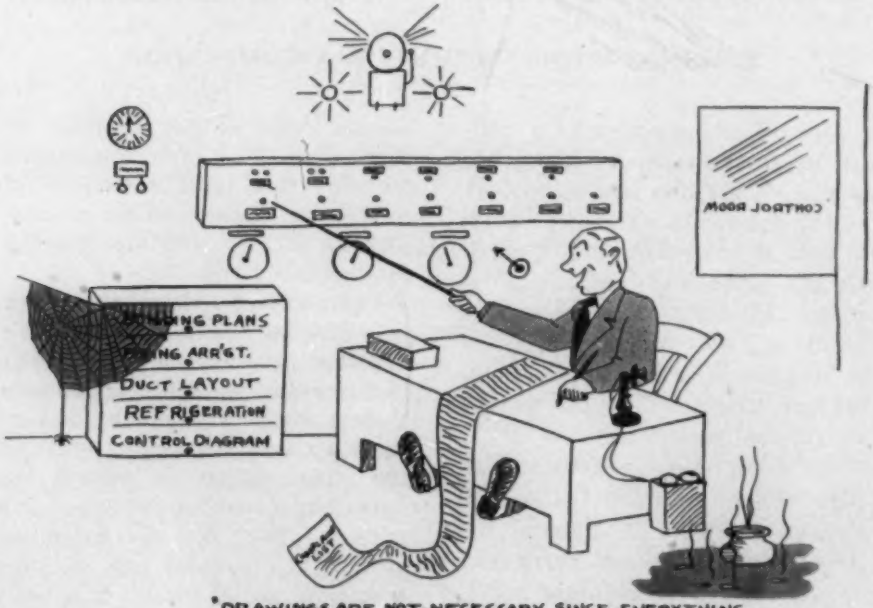
Suggests Scale for Rating Methods

CAN OPERATORS of large air conditioning plants do a better job? Are such plants giving the best possible performance? Many of these plants, with their diversity of air units and their variety of daily problems, lack the necessary "finish" to give their best performance. By "finish," I mean the operating aids that are frequently overlooked.

The prospective purchaser will want to know that there is more to a "finished" plant than the mere meeting of the terms of the construction contract and the paying of final bills. The operating man will want to know exactly how his equipment measures up.

With modern apparatus and the best present day design, our large plants should consistently give nearly perfect air conditioning—winter, summer, and in-between. Today the design engineer works with considerable exactness. There are few insoluble problems of load calculation and there is a broad choice of equipment available. Better building materials have assisted the air conditioning engineer. In the matter of building planning, the more favorable assignment of space for mechanical equipment has proved advantageous both to the engineer and to the purchaser.

The industry as a whole is working toward perfection in equipment and design and is utilizing new concepts of air conditioning. But are the operating people getting the necessary aids that will enable them to turn out the best job? Have they, in reality, "finished" air conditioning systems?



"DRAWINGS ARE NOT NECESSARY SINCE EVERYTHING IS OPERATED BY REMOTE CONTROL ANYWAY." TAKE OFF 10 POINTS!

System Performance Hard to Measure

It is not an easy thing to determine to what extent the system performance measures up to design expectations because operating technique is so difficult to evaluate. While purchaser satisfaction is a measure of overall system performance, it is a term which defies qualitative definition and it cannot serve as a guide to operating success or failure.

Since a finite measure of operating procedures and techniques is not obtainable, the approach to the operating problem must be one of

objective probing. Weak spots will then be uncovered. If your plant performance is open to question, or if bad luck with air conditioning seems to be your lot, you may discover some interesting points among the suggested items which go to make up a "finished" plant.

The elements of the "finished" plant are itemized and evaluated here in "check list" fashion. The evaluation is an arbitrary one and it may be that I have exaggerated the importance of some features and glossed over (or omitted) others. Results have been given first place prominence; operating economy is secondary. The list is offered as an index to some of the basic air conditioning operating faults.

Check List Gives Arbitrary Rating

See if your plant has all the operating aids (at the New York Stock Exchange we are lacking several.) It works this way: The figures shown are maximum ratings. You can estimate the extent to which you fulfill the specific requirements of each item. A rating of 80 means your operating picture is O.K. but there is room for improvement.

I. Operating Personnel:

A. The "operator",* responsible for overall system performance,
   1. Has had specific training in air conditioning, including some schooling in physics, thermodynamics, fluid mechanics, etc. .....(15)
   2. Has had air conditioning design and layout experience. .....(15)
   3. Personally checks each complaint. .....(10)

B. The scheduling of the "tours of duty" of qualified personnel is such that refrigeration and/or heating is available during all normal business hours and this can be extended to meet all emergencies. .....(10)

Total for operating personnel. .(50)

II. Operating Aids:

A. Drawings:
   1. Mechanical and electrical construction drawings, covering all air conditioning apparatus, are immediately available. .....(5)
   2. These drawings are kept up-to-date. .....(5)
   3. *Special operating drawings* are available, showing air quantities *as measured*, damper and valve locations, access doors, etc. This includes an "interpreted" control diagram for air units and zone heating. .(10)

B. Specifications and manufacturers' literature covering all apparatus are kept on file. .....(5)

C. Critical spare parts are kept in stock. .....(5)

Total for operating aids. .....(30)

III. Operating Records:

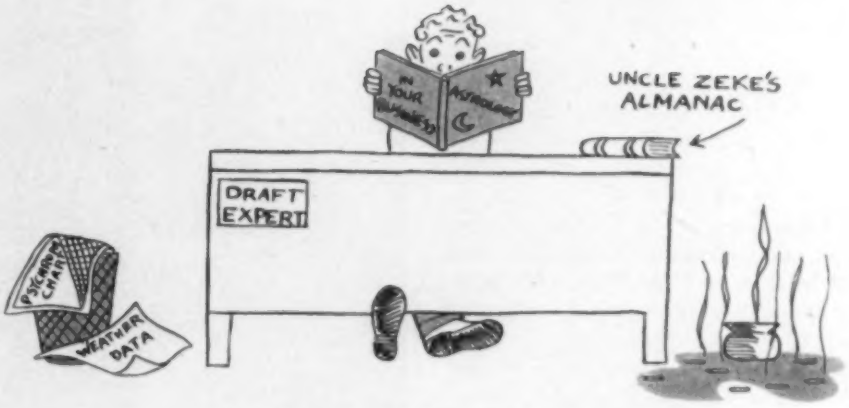
A. All complaints are recorded. .....(4)

B. Daily logs are maintained:
   1. Covering performance of air units. .....(4)
   2. Covering refrigeration plant performance. .(4)
   3. Covering heating plant performance. .....(4)

C. A record is kept of servicing operations (filter cleaning, steam trap replacements, etc.). .....(2)

D. Cost records of supplies, materials, maintenance labor are kept. .....(2)

Total for operating records. ..(20)



IF THE "AIR MAN" KNOWS WHAT A PSYCHROMETRIC CHART IS BUT DOES NOT NEED ONE, DEDUCT 20%

[The sketches—drawn by Roger J. Arnold, one of the electricians at the New York Stock Exchange—are intended to illustrate some of the incidents to which this scale might apply.]

DONALD A. KEPLER, chief engineer of the New York Stock Exchange Building Co., and author of a recently-published series of articles in HPAC on the history of air conditioning at the Exchange and plans for modernization, inaugurates here what we hope can be a more or less regular feature—a page or two devoted specifically to air conditioning operating problems. . . . "I believe," he says, "that there is a need for some sort of guide on which the building or plant owner can base his air conditioning *operating* requirements. I have taken it upon myself to establish some standards and I have done this in such a way as to invite open attack. Should this article become the target for criticism, providing some of it is of a constructive sort, a more appropriate set of standards might be evolved. This is the immediate intent. . . . In this article I have dealt with operation from the standpoint of *performance results only*. In future articles it is my intention to elaborate on these outline subdivisions, and in addition to include comments applying to *operating* economy and its complement—maintenance."

*While the ultimate responsibility must be fixed, the actual operating may be done by more than one person.

Lowering prefabricated pipe units into trench directly from delivery truck

New Underground Tie Line Boosts Tail-End Pressure

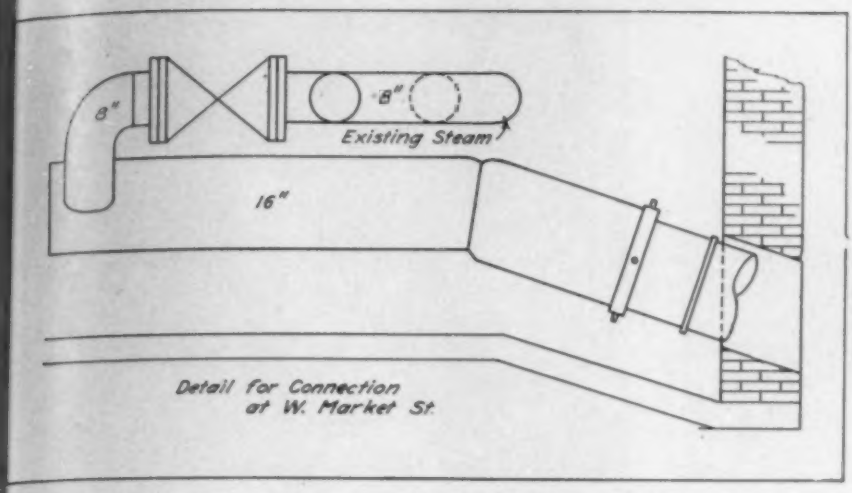
PERCY A. HYDE, steam sales representative of the Ohio Edison Co., Akron, describes here the installation of an underground 16 in. steam tie line constructed of prefabricated insulated pipe units of 21 ft length, using Schedule 20 steel pipe. Inherent strength of the conduit enabled installation under only 2 ft of cover in many instances. Various details of the construction—including the simple method of running the line beneath railroad tracks and the ventilation scheme to protect adjacent underground electric cables from undue temperature rise—are described. The new line has enabled increasing the tail-end pressure of the steam distributing system to the correct value, at the same time dropping the boiler pressure required

CONSTANT GROWTH IN steam sales by the Ohio Edison Co., Akron, from the fall of 1927, at which time the steam distribution system was started in Akron, up to the fall of 1946, had reached a point where the capacity of the main feeder from the Beech St. plant was being taxed severely. This plant, which distributes live steam only and does not utilize exhaust or bled steam in conjunction with electric generation, ranked 20th in size of operation of district heating companies in 1946. Four hundred twenty-two customers are served with more than 600 million lb of steam annually through an underground piping distribution network nearly 10 miles in extent. There is excellent saturation of steam in areas served.

Several years ago, some consideration was given to installation of another feeder from the Beech St. plant, since considerable trouble was experienced in maintaining the proper pressure at the end of the line during peak demands. In 1946, it was decided to construct a new feeder from the plant to supply additional insurance that pressures would be maintained.

It was decided to construct a 12 in. line from the south end of the present boiler header, and then, from the plant out to the distribution system, construct a 16 in. feeder and tie it into the 8 in. line at Market and Canal Sts. Several methods of construction were given consideration and it was finally decided to use prefabricated insulated pipe units with Schedule 20 steel pipe completely encased in helical corrugated conduit. The insulation is made up of 2½ in. of fiber glass.

The line is very shallow at some points and it was necessary to get as much insulation as possible and practical. Where previous pipe line construction in city streets of necessity was deep, the inherent strength



of the corrugated iron conduit in many instances enabled installation of the tie line under only 2 ft of cover. The entire construction is in dirt and the contour of the ground lent itself quite readily to this type of construction. The expansion joints are the gun packed type. Two of them are located in one manhole and one single joint in the second manhole.

Ventilating System Protects Adjoining Electric Cables

Due to the fact that high voltage underground cables were within 5 ft and running parallel to the new steam line for a distance of approximately 175 ft before the connection to the 8 in. line, it was decided to build a ventilating system between the steam and electric ducts to prevent a temperature rise in the cable system and resultant loss of capacity. An accompanying sketch shows a cross section of this ventilating system. The ventilator consists of three 4 in. conduit pipes manifolded into an 8 in. conduit at each end. In this area there is a rise in grade of about 20 ft, so with the lower manifold connected to the air inlet pipe and the upper one to an exhaust pipe, a very fine flow of air is obtained by gravity. To date this arrangement has given very satisfactory service.

The 16 in. tie-line, approximately 800 ft long, leaves the Beech St. boiler plant paralleling the main 15 in. feeder, then veers sharply south into Canal St., forming a loop in connection to the 8 in. feeder at West Market St. Another sketch shows a detail for the connection to the existing 8 in. steam line.

Various stages in the installation of the new 16 in. tie line are shown in the photos. One of them shows a contractor's crane boom lowering the prefabricated pipe units into a trench directly from a delivery truck. Several 21 ft units were completely welded together above ground and jacked under the tracks of a main line of railroad, without interrupting train service and with a minimum of excavation. Note the narrow, shallow trenches paralleling the rail tracks in one of the pictures.

Tie Line Boosts Tail-End Pressure

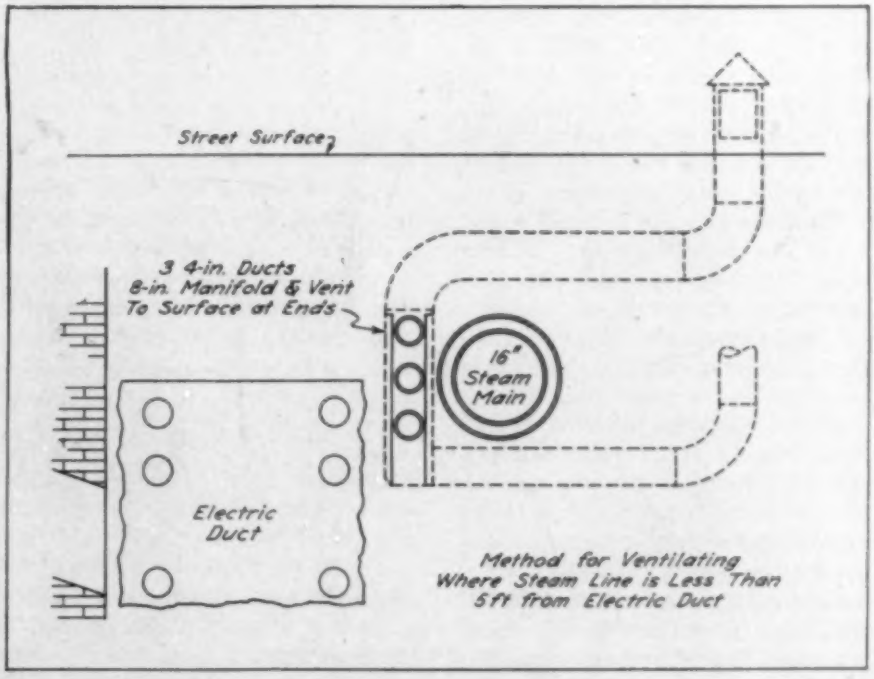
The operation of the line since it went into service the first part of December 1946 has more than met all expectations. On the day the line was actually cut into service, approximately 185 psi pressure was being carried at the boiler header, feeding into the system at 135 psi. Difficulty was being experienced in maintaining a tail-end pressure o 115 psi.

It was extremely interesting to watch the plant's operation as the 16 in. line was cut into service. Within 24 hr, extremities of the Market St. line built up pressures much greater than required and the system had to be stabilized at the boiler plant. The boiler pressure gradually dropped until it was possible to get along with a boiler pressure of approximately 160 psi with the correct increase in tail-end pressure of from 8 to 10 psi.

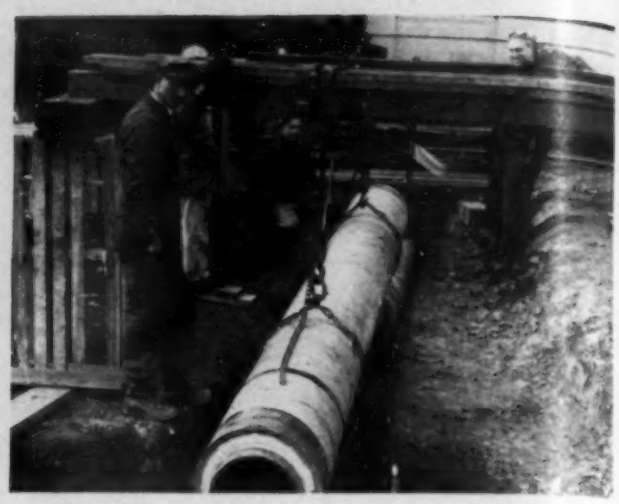
The method of operation is to use the 6 in. bypass around the 12 in. gate valve and the line operates as a stabilizing element for the 15 in. and 8 in. lines in Market St.

Rather exhaustive tests were run on the actual condensate loss in the line both by steam flowing through it and with the Market St. end shut off. These losses showed that the operation of the new line was well within expectations with regard to the estimated line loss.

Experience with this new line shows that it would not have been possible to carry the proper tail-end pressure during the extremely heavy loads in the early part of 1947 without this new feeder in service. It was also designed so that the present 15 in. line could be completely taken off during the summer for the installation of new expansion joints without shutting down the entire plant—which was



Note the narrow, shallow pipe trenches in this view. Akron's First National Bank, seen in the background, has been an Ohio Edison customer for many years



Several of the 21 ft pipe units were welded together above ground and jacked under railroad tracks without interrupting train service and with a minimum of excavation

always necessary in the past. The actual costs of the line were also well within the estimates.

New Tie Line Scheduled for '48

Another tie line, scheduled for construction in 1948, will connect the newly installed 16 in. steam line with a 14 in. line at Howard and Mills Sts. and a 6 in. line at Quaker and Bowery Sts. Steam pipe diameters will range in reducing sizes from a 14 in. connection to the 16 in. line at Canal and West Market Sts. to an 8 in. line at the extremities. The function of this line also is to loop the area to insure uninterrupted service in event of a pipe line break or repacking of expansion joints in that section.

The contemplated tie line will also protect pressures and services to three of the largest customers with respective peak demands of 25,000, 15,000, and 20,000 lb per hr of steam. In that same area, the company has this year contracted for steam requirements that mean an additional load of 25,000 lb per hr.

[Photos courtesy the Ric-wiL Co.]

Refrigeration Is Basic Necessity in Today's World

In an address last month before the American Society of Refrigerating Engineers at the Newark (N.J.) Athletic Club, William B. Henderson, executive vice-president of the Air Conditioning and Refrigerating Machinery Association, Inc., stressed the fact that refrigeration is a basic necessity in today's world.

"In times of national and world crisis the headlines may scream about metals, rubber, petroleum, food, and other vital necessities," Mr. Henderson said, "but refrigeration, if mentioned at all, usually is accorded but a small and passing footnote. Overlooked is the fact that, without refrigeration, only a minute fraction of our nation's enormous food output could move more than a few miles from the producing farm."

Besides the obvious commercial and home uses, thousands of manufactured textiles, precision instruments, electronic equipment, chemicals and medicines need controlled temperature and humidity conditions, he explained. Synthetic rubber and petroleum processing, automobile and airplane manufacturing, metals made to fine tolerances—all rely on refrigeration. In the development of atomic power, the tremendous heat produced by atomic fission can be controlled only through large volumes of cooling. The Manhattan Project during the war required refrigerating capacities never before conceived. The Hanford, Wash., atomic development pile alone required double the capacity of the largest prewar installation. Each peacetime atomic power installation will require corresponding cooling capacity.

In our nation's preparations for defense against possible future atomic attack, Mr. Henderson stated that refrigeration and air conditioning assume their traditional role of vital essentials. In any wartime emergency, factories would have to operate and people would have to live underground. Food and other materials would have to be stored and preserved. Air would have to be kept free from all contamination by conditioning equipment.

SEES ALLTIME HIGH BUSINESS THIS YEAR

Cloud Wampler, president of Carrier Corp., said last month that his company expects to do a $50 million business in 1947, compared with a peacetime sales record of $18 million and a wartime record of $38 million.

Mr. Wampler's remarks were made at ceremonies marking the formal opening of the company's newly-acquired plant at Syracuse.

Design Engineer Reports on Operating Experience

MARINE PIPING PROBLEMS . . . Some Funny, Some Serious

JOHN H. CLARKE wanted to get information on the problems with piping systems, pumps, valves, heaters, control and other mechanical equipment faced by the operating man . . . how designs perform in actual service . . . how equipment is actually operated. The answers to these questions were among his objectives when he (a marine design engineer by training and profession) shipped on a tanker as junior third assistant engineer. By the time his seagoing phase was completed (he's now back on land as a design engineer with the Standard Oil Company of Indiana) he got plenty of practical information on piping, pumping, heating, ventilating, and other subjects. His comments and observations on much of his experience are continued here from our October issue. A lot of what he found out applies not only to marine work but to the design, operation, and maintenance of mechanical equipment in plants and buildings as well.

As WITH ALL trips of this sort, there were humorous as well as serious occurrences.

On one occasion, I reported for my watch and found the second assistant was in a great dither over the apparent high salinity of the condensate. Almost universally, ship boiler water is tested on the basis of salinity, alkalinity, and phosphates rather than the total-solids method common for shore practice. The main reason for this is that the greatest danger arises from a possible sea water leak into the condensate system. Consequently the condensate salinity should be checked each watch on a well run ship. This was seldom done on our ship, and the second assistant who handled the boilers, and was supposed to watch and control the boiler feedwater, was quite careless about taking condensate tests. (Boiler water tests were taken once a day.)

An automatic salinity indicator and alarm was provided on the ship but we weren't positive of its proper operation. In any case, the second engineer saw the needle quiver on the automatic indicator and it evidently nudged his conscience a bit, so he took a condensate sample and tested it. Normally the condensate tested about 1.5 grains per liter. He put in enough indicator (chemical) to show about 50 grains and still didn't get a test. About this time he began to perspire and made a dash to telephone the chief. I arrived on the scene as he was making a second test, which was no happier than the first.

The chief arrived about this time and, because we had been Butterworthing earlier in the day, jumped to the conclusion that the Butterworth (tank cleaning) heater was leaking and permitting salt water to enter the condensate system. So he made a mad dash to shut it off, only to find that it *was* off. In the meantime, I made another salinity test with a separate test outfit kept at the log desk, and that test showed normal. A retest showed the same thing. By this time the chief had slowed down to the point where he could be talked to sufficiently to be told the facts.

We don't know what the second assistant did—whether he didn't clean his test tubes, or whether he perspired so freely that he was testing for sweat salinity instead of condensate salinity. But in any case, a good time was had by all while it lasted.

Just before arriving at Abadan we had another of those transfer incidents which took place so often on this ship. This time, I was *not* on watch, but was just coming on to relieve the second assistant for dinner. As usual, the ballast pump forward was running on its own and no one had secured the double bottom (raw reserve feed) manifold valves—so, when the tanks filled, there was a deluge on the generator flat from the tank overflows.

This time it was rather serious. The generator flat had a number of grating openings, supposedly to permit ventilation air to rise from the lower engine room spaces. The water poured through these gratings and down upon the drip-proof motor and starter for the auxiliary circulating pump. Water was splashing all over the place. The tank manifold valves were immediately closed and, as a precaution, the crossover from the main circulator was opened to the auxiliary condenser, and the auxiliary pump

the river was lined on either side

The copper deck exhaust line was

sweltering. But the natives were

secured until the electrician could check the pump and starter to be sure that no damage had been done. This check revealed that while there was water in the bottom of the starter box, everything (including the pump) seemed to be dry—so the pump was then put back into service.

Trouble, Trouble, Trouble

As an aftermath to this incident, we managed to put on a real show. At the same time that the double bottom tanks had been filling, the cofferdams just outboard of the aft pump room were being filled. In transferring fresh water aft, the fire main was used back to the aft deck house, and then fire hose was used the rest of the way to the tank openings or connections. In this case, a fire hose was stuck down the manhole trunk of the cofferdam, but it wasn't too well secured.

I was on watch during this incident and the first engineer called down and requested that we cut off the deck steam because they were through with it. However, this could *not* be done immediately, as the oiler was below making a round and someone had to be near the controls. The first engineer had been too lazy to go forward and secure the pump in the forward pump room and had depended on our stopping it when we secured the deck service, but (as usual) he didn't mention this.

In the minutes before we got the deck steam secured, the hose in the cofferdam trunk flew out and proceeded to pour water all over the ship. A sizeable amount was distributed between the chief engineer's office via a porthole, and the upper deck passage to the crew's quarters; the latter got about a ton of water. While it was inexcusable, it was still very funny—as long as it wasn't your own stateroom. But if the chief and the first assistant disliked each other before, they really got down to a feud after that event.

River Water of 96 F

Coming across the Indian Ocean and just above the equator, we reached the highest sea temperatures recorded on the trip, about 87 F. It was late in April and consequently *not* the hottest weather for this area. Abadan had a reputation for heat and hot river water, but much to our surprise it was reasonably cool. By the time we reached the Persian Gulf, the sea temperature dropped down to 80. In the Shatt al 'Arab River, it dropped clear down to 76 F. But don't let this fool you. This was indeed the *cool* season. We were informed that during July and August, the water temperature climbs to as high as 96 F. During our visit even the air temperatures were reasonable. In the Persian Gulf, the air temperatures were in the 80's, and they were in the 90's while at Abadan during the day. The nights were hot but not nearly as bad as we had expected. We were happy that we hadn't arrived during the *hot* season.

Native silversmith shop in Adaban. Notice the goatskin bellows being used to supply air to the forge. Some of these look much like suitcases. It takes nimble fingerwork to operate them properly. The electric fan in the background is a somewhat incongruous feature of this shop. The author was not aware that these shops had electricity available

It took about a day and a half from the time we passed Ras el Hadd at the Gulf of Omar until we arrived at the pilot station at the head of the Persian Gulf. It was like coming into a new world. We saw a few sharks, but we left behind our friends the flying fish. Even the birds, who seemed to have followed us all across the ocean, left us when we entered the Persian Gulf. Everything in sight seemed barren and lifeless. Actually such is not the case, despite the appearance. We sighted Bahrein Island, location of American oil interests in Saudi Arabia, on the way up the gulf.

Our progress was slow because the captain had radioed ahead a definite arrival time at the pilot station, and he was one to keep his word if it meant traveling in reverse half the time to make sure that we didn't get there too soon. The afternoon of the last day, we travelled at the slowest possible speed, alternating this with coasting—actually. We arrived right on the dot at 4:00 p.m., the appointed time.

There was a fair amount of shipping of all sorts—tankers, cargo vessels, and native sailing craft. The latter were what intrigued us. We were inclined to believe that they were several centuries old in their design, and later investigation revealed that the design originated at least as far back as the days of Ur and Babylon.* They are heavy double ended craft, in most cases, with crudely built decking, rudder, and fittings. The larger boats are provided with stubby masts and lateen (triangular) sails.

When we finally got our pilot on board, we headed in toward the mouth of the river. Because of the flat marshes and delta land, we could not see it from the pilot station. When we finally did get to the river, it was a narrow muddy stream, anything but beautiful; the word "picturesque" might fit. The river divides Iraq and Iran, Abadan being situated in the latter.

For the 40 miles up to Abadan,

*For an interesting illustrated description of this area, see the National Geographic magazine for March 1947, pp. 325-358.

the river was lined on either side with a narrow strip of date palm groves. Beyond these groves it was entirely barren. As for centuries past, the Arabs were still attempting to create new delta land by putting reeds and similar stakes in the water to cause the river to drop its sediment and thus build up new land. One could not help but realize that in one day a good cutter dredge could fill more land than they have filled in the last 100 years —and put it where it was wanted into the bargain. As it was, the heavy shipping on the river was eroding away the banks in many places to the point where the date groves were being endangered.

All along the river we could see the adobe-like, flat topped dwellings of the natives. It is said that these are luxuriously furnished inside, but nothing is said about the outside or about the odor. Most people in this country would find the latter insurmountable. There ought to be bright prospects in that area in the future for those manufacturers of deodorizers for ventilation systems. You can't just *change* the air there; that just provides a new odor from a more direct source.

We saw many of the small river boats used by the Arabs. These are usually poled to provide locomotion. They use oars as a rule only when crossing the river; when so doing, they row like mad, as if a whole swarm of alligators were after them. The oars and oarlocks are very crude, the oars being made of poles with round flat boards lashed, wired, or nailed on and the oarlocks consisting of a peg in each side of the boat and a loop of rope. No decent oar could be used at the fast beat practised by the Arabs without killing the oarsmen in the process.

Piping and Pump Repairs

We arrived at Abadan late in the evening and anchored several miles below the refinery because we had repairs requiring welding, and were not permitted in the refinery area. The major repair jobs consisted of fixing the deck steam lines which had cracked, welding up a number of cracks in the bulkheads between the tanks, and attempting to repair the main feed pump which had failed on the way up from Wellington.

The copper deck exhaust line was removed and brazed up at the crack at the branch line; no attempt was made to straighten it. The cargo heating steam line was removed and a patch was welded over the crack as a temporary repair. They had in mind replacing the section when the ship got back to the United States inasmuch as such foreign repairs were costly and had to be kept to the minimum. All cracks that could be found, and there were a number of them in the cargo tanks, were welded up. A thorough check was necessary as we expected to carry a mixed cargo of diesel oil, distillate, and black oil.

The upper half of the feed pump casing was brought up on deck and all that was done to it was to weld up several of the cutwaters. As when a similar job was done at Baltimore the pump would almost have been better if the job hadn't been done. An attempt was made to file and chip the weld metal down to a smooth contour, but it wasn't very successful.

While the above work was being done by a shore repair crew, we busied ourselves with some repairs of our own. The first and second engineers worked on the reciprocating auxiliary feed pump and supposedly repaired the valve linkage so that the pump would operate. The second also changed a leaking gage glass on one of the boilers and the rest of us repacked a few valves.

These repairs took two days. During this time we were besieged by numerous "bum boats" in which the natives had for sale everything from native sheath knives to Swiss wrist watches. They would take money but they preferred cigarettes, candy, soap or any similar item that was scarce in their country.

These native boats got so numerous and the clamoring became so loud that at the first exchange disagreement the first mate turned the fire hose on them. But that didn't stop them entirely.

Natives Dressed for Arctic Weather

The native workers on the ship were also doing a thriving business. It is truly a sight to see one of these natives go after his bankroll after making a purchase. The temperature was in the 90's, and we were sweltering. But the natives were dressed for *Arctic* weather. To get their money, they unbuttoned in the following order an overcoat, suit coat, shirt, and the long underwear they had on underneath—after which, the buttoning process was reversed. Perhaps some insulation expert can explain this phenomenon. But considering the body heat given off at this condition, the use of such heavy clothes seems incredible, particularly when you see the scanty apparel some of the other natives wear.

Most of the items for sale by the natives were on the shoddy side, and we soon found out that the shops in the bazaar had much higher quality novelties to offer. It was here that we really learned about ventilation "as she is done in the middle east." Most of the methods and applications definitely are not to be found in the ASHVE Guide.

The native section of Abadan and the bazaar are mostly within the "U" formed by a combined drainage and sanitary ditch which leads from and to the river. This is used for bathing, laundry work, garbage, and for an outdoor privy. The water had that well-known "sewage blue" color, and an odor that almost knocked you down. We managed, however, to stagger across the bridge to the native bazaar area. The stench was not quite as bad here but it was still strong. Apparently even outdoor privies were a luxury here—or perhaps they never got used to them. Holes were dug at each street intersection and the litter, drainage from the gutter, garbage, etc. was supposed to find its way to these holes; some did and some didn't.

The various workshops along the streets were extremely interesting, although they were dirty and crowded. Much of their work was done in silver, but because silver was scarce they used any silver they could lay their hands on. Consequently, the native silver coinage had practically disappeared. Their tools were extremely crude and would have amazed any artisan in this country. It was understood that it was very difficult to get any kind of tools in the middle eastern area. One workman was seen worrying away at a piece of wood, trying to cut it with an old, dull, broken key-

hole saw blade. There was no handle to it.

Some of the silver work and, of course, all of the filigree work required heat. So they used small forges for the purpose. The air to these forges was supplied by the ordinary type of fireplace bellows in some cases. But several shops had small "suitcase" type blowers. These were operated by opening the top and pulling up to fill it with air, and then squeezing the opening closed and pushing down to force the air out. It took dextrous fingerwork but seemed effective.

Hand Operated Centrifugal Fans

But the thing that surprised us most was the little hand-operated centrifugal fans we saw. These were of the straight or paddle bladed type about 18 in. in diameter and were provided with a small crank for turning them. They probably weren't very efficient, but they did the job. For each blower arrangement, a small hose or piece of tubing was led to the forge to convey the air. Similar blowers were used for the open air grills which the natives used for cooking their meats and pastries. Despite the crude tools with which they worked, they turned out some remarkably beautiful bracelets, compacts, and other trinkets.

We covered the town thoroughly and in turn we were well covered by a convoy of natives of all ages. They stuck with us like leeches. Everyone, as far as the natives were concerned, was either "Johnny" or "Chief".

High pressure sales must have originated in this area. Every time one of us tried to drive a bargain or work out the monetary exchange, the whole crowd of natives ganged up on the deal as if it were the personal business of each one of them. The clamor was enough to make you back down just to get away from it all.

"Ventilating" Experts at Work

While the bargaining was going on, another group of "ventilating" experts was busily at work. And, brother, *they had teamwork*. My shirt pockets weren't large enough to hold my billfold and money, so I divided them between my two side trousers pockets. Despite the knowledge that the little devils—the oldest couldn't have been over 15—were trying for my money, and despite the fact that I rolled away from them twice as I thought they were attempting to lift my money, they did actually get it. This was embarrassingly discovered a few minutes later when a purchase was about to be completed. The little so-and-sos not only lifted my money but after they did so, they replaced one small bill and my Coast Guard seaman's identification, adding insult to injury.

My shopping for that day was ruined so I spent the rest of the time keeping the other men in our group from losing their money. It turned out to be a regular game. The native boys used all sorts of diversions—a woman beggar, selling flowers, card games on the ground, or anything else that would distract attention from the victim. While this was going on, one of the gang approached from the front or side and the artist of the bunch got set in the rear. It was my task to park behind the intended victim, thus breaking up the play. As soon as this happened they would set the stage for another formation.

They didn't get away with any more money. But our group separated once and the electrician and the captain went on to another shop. While they were there, one little ruffian swiped the hat right off the electrician's head. It was a good Stetson, too. When last seen, the "flying bedsheet" with the hat was disappearing down the street by the sanitary ditch or canal. It was useless to follow him. Even if you caught him, the only result would be a fight.

After leaving the native quarter, we had in mind visiting the oil company compound with the object of obtaining some good food. The main building which we visited was air conditioned and, in the existing climate, the cool atmosphere was a lifesaver. They had a beautiful lounge, a reading room, and a large dining room. But the latter was no help to us; this was a company dining room and with rationing as tight as it was there, no visitors were permitted. So ultimately we wandered back to the ship and ship chow was consumed as usual.

In all, we spent six full days in port. But we had a busy time at that. In tying up the ship, the pilot and the shore crew on the ropes got a bit careless and we wound one of our hawsers around the propeller two or three times. We had quite a job getting that off. In the meantime we reinstalled the two deck lines that had been repaired—the 4 in. cargo heating line and the 5 in. deck exhaust line—and replaced the top part of the feed pump casing.

Pumping Problems

The evening before leaving Abadan, it was decided to try out the main feed pump that had been repaired and also to check the operation of the auxiliary feed pump. Up until this time we had never used the auxiliary feed pump except for low pressure transfer purposes, such as filling the distilled reserve feed tank.

We tried the main feed pump first and it again failed to develop sufficient pressure to feed the boilers. We then tried the reciprocating auxiliary feed pump and while doing so, the aft main feed pump was left in service. The valve rod on the auxiliary pump operated reasonably well but it was immediately evident that the suction check valves were leaking seriously. We couldn't keep up with the boiler feed (the main feed pump was shut down for a short while to determine this) and the valves on one cylinder were leaking sufficiently to open a relief valve on the suction side of the pump.

The first engineer wanted to let the auxiliary pump run for awhile in parallel with the main pump to see if its operation would improve. It didn't. And in the meantime, it was causing a serious pounding on the main pump thrust bearings because of the wide variation in the discharge pressure of the reciprocating pump. During this time a shaft movement of approximately 1/16 in. was taking place on the centrifugal pump, and the discharge pressure was varying sharply between about 350 and 675 psi. Because the aft main feed pump was our only good pump left, we immediately shut the reciprocating pump down so as to save the bearings on the main pump.

Such was the state of the feed system when we left Abadan early the next morning.

SAM LEWIS' PAGE

In this regular feature, informal comment on heating, piping and air conditioning matters is given by Samuel R. Lewis, consulting mechanical engineer and member of HPAC's board of consulting and contributing editors. This month he condenses a report on a small manufacturing plant, describing the changes which are to be made to improve operation. These changes might not necessarily be the answer in any other plant, but this case illustrates the kinds of things that should be given attention in order to keep a plant up-to-date. Modernization of mechanical equipment is particularly important when fuel and labor costs are rising.

Boiler Plant To Be Modernized

THIS IS A condensation of a report with recommendations covering a small manufacturing plant. The report is especially interesting to me because of the intention to purchase electric energy instead of continuing to generate it.

The facts—obtained by questioning and observation—are as follows: The boiler, rated at 5175 lb per hr of steam, burns Illinois coal with a steam driven underfeed stoker and an engine driven forced draft fan. The steam pressure is 160 psi. The boiler delivers about 10,000 lb per hr. The horizontal slide valve engine, with automatic governor, about 100 hp, drives an alternating current generator and exciter by a long belt. The engine also drives a complicated system of line shafting on the second story by a heavy belt. This shaft in turn is belted to four subsidiary shafts in two adjacent buildings and these are belted to about 50 tools of various types.

Boiler feed: One electric centrifugal pump having a special valve control so that the pump suction is equalized with the boiler pressure before starting the pump in each cycle of pump operation. Condensate from plant process devices is trapped to an open receiver. The hot water flows from this receiver into the pump receiver, which is of the alternating type. (By alternating, I mean that electronic valves first close an equalizing pipe between the pump receiver and the boiler, and open the receiver to atmospheric pressure, so that a charge of condensate can run into the pump receiver. When the pump receiver fills, the valves reverse and, following closure, the pump operates to deliver the water into the boiler.)

A second pump, this one steam driven, takes suction from an open type cast iron feedwater heater which receives raw city water via a float valve. The duty of this second pump is to replace the water from the boiler that is lost via the exhaust steam from the engines. There is a heavy demand for hot water at 180 deg, and the exhaust steam from the main engine, stoker fan engine, stoker engine and pump, all enter an exhaust main. At one end of this main the little cast iron feedwater heater receives some steam, while at the other end there is a cascading type open feedwater heater, in which the entering city water falls over superimposed trays counterflow to the exhaust steam.

Thus, practically all the exhaust steam is condensed, and the resulting water enters the hot water system and is lost to the boiler. To compensate the boiler for the accumulations of debris such as lime and other undesirable guests, the custom is to introduce large volumes of boiler compound. The boiler compound salesman visits the plant monthly, usually to protest to the fireman that the latter fails to blow out the boiler often enough or seriously enough at each blowing. Naturally if we boil the salts out of dirty water these salts will remain in the boiler and if we add medicine alleged to do something about the salts, we must sooner or later get rid of the medicine and the salts. The fireman, operating the boiler at about 200 percent of rating, works so hard to hold the steam pressure that his soul bleeds whenever he must open the blowoff valve and waste a lot of scalding hot water to the sewer.

The rather good automatic engine, the vertical stoker engine, the generator, the pumps, the switchboard and instruments and the chief engineer's records and tools as well as his home-going clothing all are in the same room that houses the boiler, stoker, coal, ash, etc. Whenever the stoker cycles, gas and

dust and ash blow out through the cracks in the boiler masonry. Thus the engines and the gages and the engineer's clothing and the engineer himself all are covered with dust and grease and sweat and mud.

We are on the way to accomplish the following:

1) Retire and remove the generator and engine and line shafting and belts. Install individual motor drive throughout the plant. Purchase electric energy. This is based on a demonstration that the saving in coal and other supplies thus attained will purchase all the electricity required.

2) Install a new boiler with a spreader stoker capable of furnishing all necessary steam at not more than 150 percent of rating, and of such type that there shall be neither outward leakage of any dust nor inward leakage of any air through the encasement and insulation.

3) Install boiler feed pumps that respond to the water demand of the boiler, as by a water line governor, rather than to the observations of the fireman or to the accumulation of water in some receiving tank. (This is to scratch the itch where the itch occurs.)

4) Heat the process hot water by duplicate closed heaters, controlled thermostatically, and delivering all condensate back to the boiler.

5) Provide a deaerating feedwater heater arranged automatically to alleviate the dissolved gases that may enter with the city water.

6) Exercise temperance in the application of boiler compound and in purging the boiler. The plant isn't big enough to justify a continuous blowdown with heat recovery, nor is the city water evil enough to require copious compounds.

With all exhaust steam lost, the accumulation of scale and dissolved corrosive gases required attention, but with practically all condensate returned, the salesman for boiler dope can reduce his complaints. The new plant will be clean. Coal will not be touched by human hands. Some white paint will be spread around. The gages and several essential new recording and indicating instruments will be wiped off occasionally so that their information may be noted.

Fuel Saving Data From Bureau of Mines

Answering hundreds of practical questions on fuel saving practices and fuel conservation measures, the Bureau of Mines has combined in a single publication all of the material used successfully in the wartime national fuel efficiency program "that resulted in the saving of millions of tons of coal annually and in proportionate savings in other fuels," James Boyd, director of the bureau, announced last month.

Launched during the war as a part of the nation's critical resources conservation campaign, the national fuel efficiency program enlisted the aid of more than 20,000 volunteer workers in industrial plants, office buildings, apartment houses, schools, churches, hospitals, and theaters throughout the country to save fuel.

The effectiveness of the campaign has been demonstrated by the fact that many fuel saving measures recommended during the war are being continued and extended to many other operations in peacetime. Although the program was concluded at the end of the war, requests for further information have continued at a high rate, according to bureau officials.

The most effective material distributed during the two-year campaign proved to be an extensive series of question-and-answer "quiz" sheets covering nearly every phase of fuel saving. All of these sheets are included in the present bureau publication issued as Bulletin 466 and for sale through the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

In the preparation of the quiz sheets, many engineers outstanding in the field of fuel utilization contributed valuable suggestions based on years of practical experience with fuel problems. Experts in each field were chosen to prepare questions and answers, and the series was divided into seven groups covering combustion equipment; draft and combustion air; instruments and controls; pumps, traps, and valves; cleaning and miscellaneous; heat utilization and distribution; and prevention of heat losses.

Bulletin 466 forms a companion to another publication now in preparation which will give a historical report of the national fuel efficiency section of the Bureau of Mines, personnel, methods of work, and accomplishments. Material for the publications was prepared by J. F. Barkley, chief of the bureau's fuels utilization division; Thomas C. Cheasley, former supervising engineer, and K. M. Waddell, former assistant supervising engineer, both of the national fuel efficiency section.

Copies of Bulletin 466, A Guide for Reducing Fuel Consumption in Commercial Plants, may be obtained only from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for 50 cents. This bulletin is NOT sold by the Bureau of Mines.

ASME ANNOUNCES NEW HEAD

The election of E. G. Bailey, vice president of the Babcock and Wilcox Co., New York, as the next national president of the American Society of Mechanical Engineers, was announced last month. Mr. Bailey, who succeeds Eugene W. O'Brien of Atlanta as president of the ASME, is noted as an authority on fuels, combustion, and power developments.

Among the ASME's new regional vice presidents is Thomas E. Purcell, general superintendent of power stations, Duquesne Light Co., Pittsburgh; Mr. Purcell was the author of an article published in the October 1935 issue of HPAC on the telemetering system of the Allegheny County Steam Heating Co.

QUESTION OF THE MONTH

More Readers Send in Answers to Air Distribution Problem

THERE WAS PUBLISHED in the July issue of HPAC a question from "T.L." (a consulting engineer) regarding air distribution in a theater. Since then, answers to this question and comment on it from several readers have appeared, and a number of other answers have been received by the editors.

Because of the apparent interest in this question, "T.L." has prepared the accompanying sketch (the dimensions varying somewhat from those given in July). He writes as follows:

"The problem is to heat and cool the theater and lobby by side wall outlets. About 25 percent of fresh air is assumed to be taken into the equipment.

"No provision is made to exhaust the fresh air thus taken in. No provision is made to circulate all outside air.

"All return air is to be taken into inlets at the stage and returned to the equipment.

"In my opinion, the requirements are such that efficient air conditioning, either heating or cooling, would be impossible. I therefore declined to attempt such a design.

"The architect claims that 'experts' have assured him of satisfactory and efficient results. This is contrary to anything I might know about air distribution and the results actually desired or that should be obtained.

"Apparently this problem is of interest to a number of HPAC's readers. Their comments and suggestions are of real interest and value to me as well as many others."

FACED SAME PROBLEM SEVERAL YEARS AGO

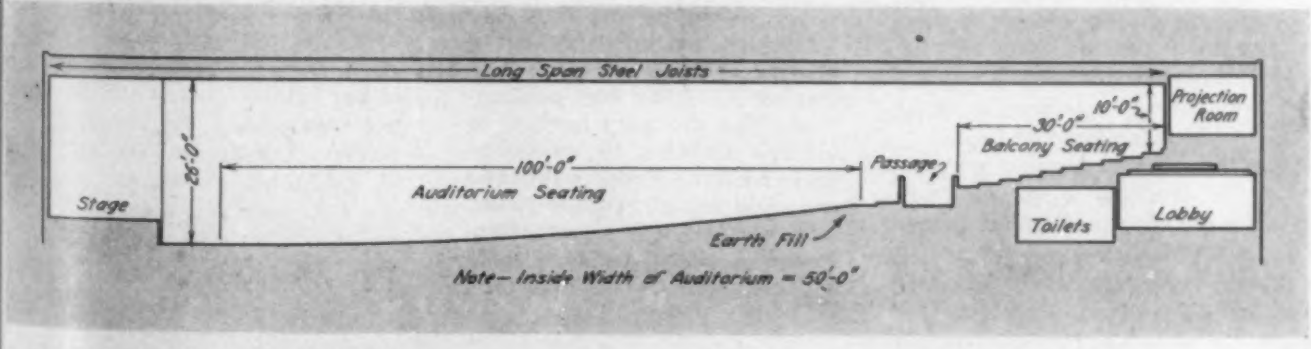
I READ WITH interest the question of the month about return air intake location in theaters in the July issue as I had the opportunity to project several special cases as to air distribution and return in theaters.

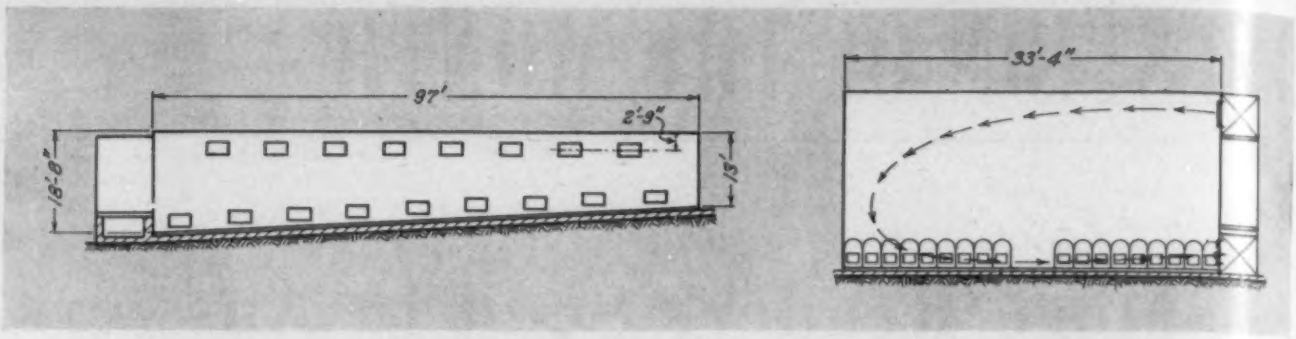
I think that air distribution from ceiling outlets is about the most perfect way this problem can be solved in theaters. At least, all theaters built in this city in the last years have been designed with ceiling outlets. With ceiling outlets assuring uniform air distribution the location of return air intakes is of secondary importance, although even in these circumstances return grilles located only below the stage do not give quite satisfactory results, as we had the opportunity to prove in one such case.

There are special cases, however —mostly in small theaters with other floors above the theater where it is impossible to provide ceiling air outlets. In these cases good air distribution becomes a delicate problem and the location of return air intakes gains more importance in order to help to establish a satisfactory air distribution.

Some years ago we had to face a problem of a small theater similar to that described by "T.L." The auditorium is 97 ft long, 33 ft, 4 in. wide with 18 ft, 8 in. ceiling height at the screen and 13 ft ceiling height at the other end. At one side of the conditioned space we found a passage which gave us opportunity to place a supply duct outside the longitudinal wall of the theater

Here is "T.L.'s" sketch of the theater under discussion





"G.T.L." says that this job was completed six years ago and there has not been a single complaint about drafts

with side wall inlets for air distribution. After careful consideration we reached the conclusion that to assure satisfactory air circulation the main return duct would run parallel with the main supply duct but, of course, at a low level. Placing the return air intakes on the lower part of the same side wall where supply grilles have been placed and with a correct supply air velocity, the air will have to travel across the whole width of the theater, returning at about floor level.

The sketches show the longitudinal and transverse sections of the theater. It may be noted that return air intakes have been placed not exactly below supply grilles, but always between two supply grilles.

The job described was completed six years ago and furnishes year 'round conditioning to the theater. In all these years not a single complaint has been received as to drafts or faulty air distribution.—G.T.L. (Buenos Aires).

THINKS JOB CAN BE DONE SATISFACTORILY

IN THE JULY issue comment was invited on the Question of the Month which had been submitted by "T.L." Then, in the August issue, comments from "S.R.L." and "J.A.E." were printed. May we offer additional comments?

In the original statement of conditions, the ceiling height at the rear of the theater was given as 8 ft. This seems too low, and therefore our comments are based on an 18 ft ceiling, which is more normal.

Further, no information is given as to the exposure of the building. Whether or not there are adjoining buildings which are heated or cooled or both makes quite a difference, particularly for those seats near the side walls. We have assumed that there are no adjoining buildings, since that is the more severe condition.

We are of the opinion that a year 'round conditioning system using side wall supply outlets and return air intakes located in the 2 ft, 4 in. rise in front of the stage can be designed to give fairly satisfactory, albeit not perfect, results.

Exhaust of Ventilation Air

"T.L." is concerned because no provision is made for exhausting an amount of air equal to that supplied for ventilation. It has been our experience that if the main supply fan is designed for ⅛ to ¼ in. static pressure above that calculated as required and if the return air duct and the outside air duct are equipped with volume dampers which can be relied upon to control air flow, by adjusting the return air and outdoor air dampers, the proper amount of O.A. will be introduced into the conditioned area which will in turn force out the required amount through entrance doors, window crack, etc. In very tight construction it may be necessary to provide vent openings to the outside to facilitate this exhaust. Such design will also keep infiltration to a minimum.

Further, the ventilation which is required by the projection room, and more than likely by the restrooms, can be designed to act as exhaust from the main theater area. Also, under conditions where the heat load of the projection or restrooms is small, the amount of heating or cooling required can be supplied by the air drawn through these rooms as it is being exhausted from the theater. Generally such design is practical if the resultant projection or restroom temperatures are not more than 3 to 5 deg warmer or cooler than the theater proper.

So much for the exhaust problem, "T.L." 's other worry seems to come from the fact that all of the R.A. is taken from the stage end of the theater. Assuming 20,000 cfm supply air, 7500 cfm outdoor air, and 12,500 cfm return air, there will be definite air motion both toward the return intakes and also the entrance doors, projection room, and restrooms. If there is the normal aisle between the front row of seats and the stage rise, there should be no discomfort from air flow over the patrons. For if all of the R.A. crosses the aisle within 3 ft of the floor, using the width of the theater, there would be an air velocity of 82 to 83 fpm. Actually, assuming an aisle width of 8 ft, the air flow at the first row would be taking place through a cross-section at least 45 by 8 ft, which would result in a velocity of 35 to 36 fpm. The return air grilles should extend more or less completely across the stage rise. By using the space below the stage as a return air plenum and letting the return air intake grilles merely empty into this space, and then having the return air duct draw from this area at the most convenient location, the ductwork can be simplified at no disadvantage to performance.

So, it seems to us that the problem of exhaust and return air can

YOU ARE invited to submit a heating, piping, or air conditioning question for publication. You are also invited to submit answers to questions from others. Those published are paid for at regular rates. Address The Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2

e met with fair satisfaction. To s the real problem is to keep uniform conditions throughout the rea, particularly for the one or wo seats nearest the side walls. At his location the circulation due to he supply air diffusion is least ffective. On the heating cycle, if here are to be any cold drafts own the wall due to heavy heat osses, they will be most severe at his point; on the cooling cycle this s the location most likely to be in n eddy and therefore slightly warmer. However since the length f blow of the supply outlets is only 3 to 25 ft, half the theater width, he outlets will be comparatively mall and rather closely spaced. Therefore the use of outlets giving igh diffusion effect should induce ufficient air motion to make even he seats nearest the wall not uncomfortable.

In short, by taking advantage of he projection room and the rest-oom exhaust system to stimulate ir movement in the rear of the heater, and by using a fan which an introduce the required amount f outside air against a slight interal pressure, thereby getting the equired exhausting through the ntrance, etc., we think that the ystem can be designed to be satisactory. At the same time we agree that this is not the best layout, and it seems unfortunate that the system cannot be designed for maximum performance.

Disagrees With "S.R.L."

We cannot agree with "S.R.L." that return air intakes near the floor will "be sure of trouble." It is our experience that low return air intakes are quite satisfactory except when there are appreciable amounts of smoke, etc. to be removed. Since most supply outlets tend to create an eddy area about one-third of the distance from the grille to the floor, under such smoke conditions an exhaust or return air intake drawing from this intermediate level is very effective, particularly with high ceilings. Contrary to "S.R.L.", the use of overhead return air intakes can definitely short circuit air away from the room.

The use of 100 percent outside air during those seasons when it is the proper temperature is very effective if the controls are intelligently and thoroughly used. However, this requires either a very competent operator "on the job" or a fairly elaborate control setup. When such 100 percent outside air operation is used, a secondary positive exhaust system is generally required.—G. S. C.

Here Are Ideas for Filing Engineering Information

QUESTION OF THE MONTH published in the August issue was contributed by "R.A.W.". He wanted to know how engineers and contractors solve the problem of filing engineering information without setting up a library or an elaborate file room.

In addition to the comments on this matter published in the October HPAC, several other replies have been received.

WE HAVE A SIMPLE, EFFECTIVE SYSTEM

WE HAVE A simple and effective system in our office for locating desired information on various articles published in magazines.

As an illustration, in the April issue of Heating, Piping & Air Conditioning, page 77, the title is, "Unit Heaters, Finned Pipe Radiation for Standardized Factory Building." This title was broken down into seven significant nouns as follows:

1) *Unit* (Heaters, Finned Pipe Radiation for Standardized Factory Building.)

2) *Heaters*, (Unit, Finned Pipe Radiation for Standardized Factory Building.)

3) *Finned* (Pipe Radiation, Unit Heaters, for Standardized Factory Building.)

4) *Pipe* (Radiation, Finned, Unit Heaters, for Standardized Factory Building.)

5) *Radiation*, (Finned Pipe, Unit Heaters, for Standardized Factory Building.)

6) *Factory* (Building, Standardized—Unit Heaters, Finned Pipe Radiation for)

7) *Building*, (Standardized Factory—Unit Heaters, Finned Pipe Radiation for)

Each of these nouns is the first word for a title for a 3 by 5 in. file card which incorporates the other words of the title to give the complete thought of the title. The purpose of breaking the title up in this fashion is that the engineer, long after he may have forgotten the title, and with probably an entirely different avenue of interest, will be able to select material at a moment's notice under the particular heading that applies to his immediate interest.

An arrangement of this sort permits inclusion of other articles with the same reader interest from various publications simply by giving the magazine name, the month and year of publication, and the page on which the article is located. After the various cards have been typed, they are filed alphabetically.

The nouns that are used on the various cards are all underscored to indicate where the other cards may be located, and for accuracy's sake, a number is placed on the upper right hand corner of the card, indicating the total number of cards made up for the one title.

We find the time invested pays big dividends when information along a certain line of thought is required. We hope this plan may be helpful to others faced with the requirement of arranging a filing system.—S. M.

"FILING SYSTEM MUST WORK FOR YOU"

THE PROBLEM sent in for comment by "R.A.W." is one that every engineer or organization must answer in a way to meet the specific requirements. To be of real and immediate value to the busy individual or small organization, the method outlined below may prove to "R.A.W." (as it has to the writer during the past 25 years) very practical and time saving.

To function efficiently and reduce the material filed to an absolute minimum the extractor should only

prepare for reference information not readily obtainable from standard textbooks on such subjects; in other words, only items that he has had occasion to spend considerable time looking for or likely to require in the future. In addition, such a system when developed by an individual of mature judgment can prove a great timesaver by providing short cuts to subordinates. As is the case with most executives, the time available for perusing technical publications is always too short. This results in more scanning than complete and careful reading of current articles.

Loose-Leaf Sheets for Article Index

Any article observed by the writer that is of more than usual interest is noted, i.e., page number, etc. If you are fortunate enough to have a stenographer, dictate filing reference, title, author, highlights of the article, together with publication, date, page, etc. The information as dictated is then typed, or written in longhand, on loose-leaf sheets 6¾ by 3¾ in. Major or sub-headings must be developed to meet individual needs. In this, the writer has always made a practice of choosing a general subject heading rather than a heading applicable to the products or work carried out by an individual company. In that way, an all time general system is developed.

A sample sheet on an article that appeared in the August issue of Heating, Piping & Air Conditioning might be as follows:

Air Conditioning, Cleaning, etc.
"Should Air Be Recirculated From Industrial Exhaust System?"
By Allen D. Brandt,
Bethlehem Steel Co.
Interesting, well-written article with data, points to be considered, and illustrations.
HEATING, PIPING & AIR COND.
August 1947
Pages 69-72

The advantages of such a system are:

1) Time saving.

2) Readily available when arranged in loose-leaf notebook or filing box.

3) A number of reference sheets on any subject or subjects can be removed from the file and taken on a business trip for consultation or reference purposes.

4) Avoids defacing of publications that should be kept for reference by the extractor and others.

The major disadvantages are:

1) Reference does not furnish detailed information.

2) Publication from which reference was taken may not be readily available.

Summing up the pros and cons, one must always remember that the prime requisite that any system must meet is "that the system works for you and that you do not work for the system."

This system works.—W. J. E.

WHAT IS BEST WAY TO VISIT BIG EXPOSITION?

HERE'S A FUNNY SORT of a question—hardly an engineering matter but one that has been asked of the editors on several occasions. It might be worded this way:

"How do you plan your inspection of the exhibits at a big exposition of heating, air conditioning, ventilating, refrigerating, power or other mechanical equipment so that you don't miss the things of interest to you, and so that you don't spend too much time on the exhibits that aren't of immediate concern?

"Also . . . How do you keep your feet from wearing out?"

We admit that these questions—particularly the second one—are hard to answer, but we think that it would be interesting to publish helpful comments from readers on the more or less important matter brought up in the first question. Suitable discussions will be printed, and paid for at regular rates. Address The Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

SYSTEM MUST NOT BE TOO COMPLICATED

MOST FILING SYSTEMS are too universal and thus become too complicated. First condition for a simple system consists in restricting it to matters of principal interest.

Classification should be headed by "Processes," and each process should be subdivided in a similar manner.

For readers of Heating, Piping & Air Conditioning and similar publications, the following classification might be practicable:

Processes:

1) Heating.

2) Cooling.

3) General application of heat exchange.

4) Drying.

5) Humidifying.

6) General application of mass exchange.

7 Air conditioning, involving both heat and mass exchange.

8) General processes, involving both heat and mass exchange.

9) Ventilation (general, without conditioning).

10) Pumping.

11) Conveying (by means other than fans and pumps).

12) Power (generation and application).

13) Measuring.

14) Controlling.

15) Processes, not specified.

Subdivision:

a) History, Statistics, Economics.

b) Theory.

c) Materials, structural.

d) Materials treated, including animals and human beings.

e) Equipment.

f) Plant description.

g) Operating data and tests.

In practice, the literature is collected in 15 compartments, each of which contains seven files. The files should be of different colors, white for (a), red for (b), etc., in order to find quickly items pertaining to the seven subdivisions.

When using such system, a difficulty often arises if articles cannot be separated without destroying the completeness of other articles. In such cases the sheet with the headline should be left with the respective article. A note should be written on the last, incomplete sheet of the preceding article describing in which file the very end can be found, e. g. "2e," if the following article concerns Cooling Equipment. This is anything but ideal, and whoever prefers the direct method of filing individual articles to the indirect method of keeping card indexes will be grateful to editors for facilitating separation by inserting short notes of only temporary interest or, better still, advertisements at the ends of principal papers whenever these do not fill sheets completely.—M. H.

"OPEN FOR DISCUSSION"

Disagrees on Many Radiant Heating Questions

IT HAS LONG been known from articles written by Dr. F. E. Giesecke and published in HPAC during 1940, and from manufacturers' bulletins on the subject of radiant heating, that the unit rate of heat transfer from pipe to concrete varies with pipe size and spacing. The 3.5 factor commonly used is recognized to be an average value and it is so practically suitable that there are probably well over 10,000 successful radiant heating installations designed on the basis of that one figure alone. These systems have been efficient and the cost of installation has been comparable to and in some cases less than that for good conventional systems.

Concerning the theoretical accuracy of the 3.5 factor, I would estimate from my experience that the average spacing of 1¼ in. pipe for these installations would fall very close to 15 in. and by interpolation of figures given by R. G. Vanderweil in his article in the September HPAC, it can readily be seen that the "old" factor of 3.5 is applicable with considerably less possibility of error than the author intimates.

From a really practical point of view, some of the figures found in the article are not applicable and may create an erroneous impression on some people. For example, 1¼ in. pipe on 6 in. centers has never been used to the best of my knowledge (and I have dealt with well over a thousand installations) and would never be considered good design. The normal minimum is 12 in. centers with a maximum generally falling between 18 and 24 in. Thus, any discussion of this type based on spacing less than 12 in. for 1 or 1¼ in. pipe is irrelevant and of no practical value. A table showing results from pipe of these sizes on 2 in. centers is just as useful or "practical" as one based on 6 in.

Must We Develop a Library of Charts?

Mr. Vanderweil's test work also stipulates "a very well insulated floor panel on the ground with tubes embedded 3 in. under the slab surface." Must we then develop a library of charts to cover every variation of insulation, slabs on grade as well as suspended, every thickness of concrete over the piping from 1 to 8 in., every type of floor covering, and other variables which exist? I am in agreement with the objectives of Mr. Vanderweil's articles, but speaking as an engineer with considerable radiant heating experience, I am afraid the result so far is confusion rather than clarification.

It is also my opinion that there is a little mathematical trickery in the example describing the effect of 200 percent error between the "old" and "new" methods. For concrete floors the "new" factors of 2.07 and 4.15 for 1¼ in. OD tubes or pipes vary from the old 3.5 factor by 41 and 19 percent respectively. This type of construction, with perhaps a finished floor covering other than wood, represents by far the major portion of radiant heating work and the theoretical error—which may or may not be accurate—does not, of course, even approach the 200 percent mentioned.

The "certain intermediate slabs" to which Mr. Vanderweil refers are apparently suspended floor slabs covered with wood on sleepers. If so, the values in the table for ground slabs do not apply. Even if they did, the "old" factor of 3.0 for wood on sleepers over concrete would be questionable since I have never seen this figure in any published data. The use of such a factor could be justified only on the basis of a water temperature increase which was anticipated at the design stage, since the overall conductivity of wood and an air space is considerably less than 3.0. Furthermore, the use of the 200 percent deviation between "old" and "new" factors is again irrelevant, since good design practice has never included 1¼ in. pipe on 6 in. centers.

Tube or Pipe Spacing

Under the section headed Hints on Tube or Pipe Spacing, Mr. Vanderweil states that "wide tube spacings are unfavorable in plain or linoleum covered concrete floors"

DO YOU WANT to say something about any of the articles published this month? An additional comment, or perhaps a question on some point? We follow here the custom of engineering society meetings in allowing a period for discussion following presentation of a paper. You are invited to contribute your views. Address the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2, Ill.

and "In such cases it will be found that an 18 in. spacing will give spotty heating, resulting in hot strips directly above the tube". The first quotation is extremely confusing since the words "wide" and "unfavorable" are purely relative and do not convey to the practical designer any useful knowledge.

The second quotation is not only relative, but under most conditions would be considered false. First of all, just how spotty is the heating with water temperatures varying from 100 to 140 F and with concrete thicknesses varying from 1 to 8 in. above the pipe? Does "hot" mean we are in danger of being burned or does it mean a few degrees warmer than the adjacent floor surface? Experience holds the answer and I can say from actual field investigation that many of the most satisfactory radiant heating systems in operation today have 1¼ in. wrought iron pipe spaced on 18 in. centers and even wider in bare concrete floors. Mr. Vanderweil's conclusions under this heading are again confusing to me, for while he attempts at the beginning of the article to point out the more efficient heat transfer possible with 18 in. spacing, he now classifies it as unfavorable.

Variations in Heat Loss

Under the heading Variations in Heat Loss, the author claims that the old method of computing tube output and panel losses is unsatisfactory, often wrong, and causes difficulties such as overheating the floor "above" or "below", and under-dimensioned boilers. These are extremely serious charges and with the limited evidence presented do not appear reasonable or acceptable.

Reverse losses from intermediate slabs are normally calculated in accordance with recommendations in the ASHVE's Heating, Ventilating, Air Conditioning Guide, and these have proved to be sufficiently accurate in the many jobs I am familiar with.

Of course, manual balancing valves and a standard automatic control system are essential and no attempt should be made to carry the full heating load of two floors with one intermediate set of coils. However, these are fundamental design rules and I presume Mr. Vanderweil is not referring to cases where these practices have been ignored.

Difficult to Conceive of 60 to 80 Percent Losses

It is also difficult to conceive of ground losses of 60 to 80 percent and these instances must be rare and peculiar indeed. While an unusual water or rock formation, or a combination of both, might create such a problem, I believe good construction practice under these conditions would dictate the specification of insulation, not only for efficient heating, but to prevent sweating of the floor during the non-heating season. This would appear to be a sound approach to the problem regardless of whether or not radiant heating was to be used.

Coil Temperature Drop

I feel also that some comment is in order concerning the discussion of coil temperature drop. While I have had occasion to discuss this subject with many engineers and contractors, it is preferred to present as many of the facts as possible to the individual and leave the final decision to his own judgment. Most of these men have selected a 10 or 15 F drop and, personally, I am inclined to agree with them. Since there is a limit to water temperature for both floor and ceiling systems, it seems reasonable to make each foot of pipe installed as efficient as possible and this can be done with a minimum temperature drop. Incidentally, temperature drop to most of us means the drop from supply to return at the boiler —not just the drop across the coil.

While I doubt that there is any measurable difference in the comfort produced by a 10 and a 30 F drop throughout a system, assuming the mean temperature to be nearly equal, I should like to take time to mention that the average residence and small commercial, industrial or institutional building has a number of rooms with a minimum of two exposures and thus Mr. Vanderweil's reference to the necessity of concentrating heat "near the outside wall" is again not practical. To attempt in every case to keep the warmest water near exposed surfaces would create fabrication problems where two, three, and four outside walls exist.

It may also be appropriate to mention that the selection of a given design temperature drop by no means guarantees obtaining that exact figure even during periods of continuous pump operation at peak demands. Unless we place thermometer wells at the supply and return ends of each coil or grid and regulate water flow with the express purpose of maintaining fixed temperature drop, the results under normal operating conditions will deviate from design simply because standard calculation procedures for determining friction heads and the fixed capacity of standard sizes of circulators introduce substantial margins of safety.

85 F Not Upper Floor Temperature Limit

On the subject of Coil Temperature Drop, Mr. Vanderweil again gives the impression that 85 F is the absolute and accurate upper limit for floor surface temperature. I would like to repeat that adequate proof has never been presented to definitely establish that 85 F is the upper limit for floor systems and any attempt to have such a limitation arbitrarily accepted throughout the heating industry is open to severe criticism. Mr. Vanderweil shows a definite leaning toward ceiling systems, but since the articles are intended to deal with practical design problems, I shall withhold any discussion of floor versus ceiling until a later date.

I appreciate the opportunity to comment on articles of this type, for I feel as a professional engineer that radiant heating is truly a remarkable development in the heating industry and I dislike very

consistency and application were

on which I would like to expand.

much to see the subject scrambled like eggs for personally or commercially selfish reasons.

Since Mr. Vanderweil and I apparently hold diagonally opposite views on many questions, perhaps these open discussions will result in some progress. I sincerely hope so.—PAUL S. PARK, manager, engineering service department, A. M. Byers Co.

Complete Honesty Answer to Many Controversies

SAMUEL R. LEWIS' suggestion—in his "page" in the October HPAC—that some of the controversies having to do with radiant heating be "ventilated" is a challenging one. It leads the writer to investigate mentally the reason for the controversial nature of some of these points. We are of the opinion that if all those engaged in some controversies relating to radiant heating were absolutely honest in their claims and statements, many of the controversies would cease.

Panel Location

Let us take for example the matter of panel location. Mr. Lewis has properly implied that no general rule regarding this should be followed; that is, that either the floor or the ceiling, for example, is the "best" place for the heating panel. The most satisfactory location for the panel in any room will depend on several factors—such as amount of available unobstructed area, ceiling height, characteristics of the structure, and temperature conditions.

Here is where the matter of "honesty", referred to above, comes in. Suppose that proper consideration indicates that the ceiling is the preferable location for the heating panel. (In some cases, of course, it may not be.) Then the controversy starts and the chances are that the final decision as to panel location will really be governed by the kind of piping to be used for the heating coils in the panel instead of by sound reasoning.

If heavy piping is to be used for the heating coils all sorts of argument against ceiling coils will undoubtedly be presented, largely because of the structural or installation problems that will be involved in the use of ceiling coils made of heavy piping. Unfortunately, in many cases, those to whom such arguments are presented may not be able to refute them.

At this point, the writer himself must be honest, by saying that if heating panels are properly designed and installed, comfort conditions can be produced in any ordinary room regardless of the panel location. It must be conceded, however, that there is generally a "best" way of attaining any objective.

Depth of Bury in Slab

Another controversial point involving the kind of piping to be used for the heating coils is the depth of bury in a concrete floor slab. Obviously, the easiest way to install a floor coil made of heavy piping is to lay it under the floor slab and pour the concrete over it. But, one might ask, why all that resistance to heat flow between the coil and the surface from which it is to be emitted? Here, again, "honesty" should have a bearing on the depth of bury decided upon.

SAM LEWIS' PAGE

Let's "Ventilate" These Heating Questions

At present there are apparently very little published data, based on actual installations, relative to the effect of depth of bury on the heat emission from floor slabs. It is our hope, however, that by the end of the coming heating season helpful information relating to heat emission from floor slabs will be available.

This information will be obtained as accurately as possible from a building now nearing completion and designed for daily occupancy in which both grid and sinuous floor coils are installed at different depths of bury. Each will be separately controlled and the different sections of the floor slab are insulated from one another and also from the outside walls of the building to prevent edge heat losses.

Movies Show Plaster Hugging Tube Surface

Perhaps we can add another point of possible interest to Mr. Lewis and his readers with respect to the use of copper tube in plastered ceiling panels. The building referred to above has a hung ceiling providing sufficient space above it to permit an operator to use a motion picture camera in it. We recommend the installation of the metal lath on the room side of, or below, the copper tube and fastened to the supporting members so that there will be close contact between the tube and the lath. As a result we were particularly desirous of seeing what sort of contact between the plaster and the tube could be obtained by plasterers who had never plastered a radiant heating panel before.

The motion pictures taken from above showed this very well and we found that the copper tube was very nicely embedded in the plaster. As the plaster came through the metal lath it seemed to hug the tube surface—just as desired. Ordinary gypsum plaster was used and only simple instructions regarding its

DATA SHEET Simplified Procedure for

consistency and application were given to the plasterers.

By having the metal lath on the under side of the coil, a smooth and unobstructed surface for plastering is provided and only a normal amount of plaster is required. One room in the new building already referred to has a ceiling panel as described above and an independently controlled wall panel in which ⅜ in. copper tube is installed with the metal lath behind it. Motion pictures taken during the plastering in this room clearly show the comparative amounts of plaster used and the relative time required to apply it. This is very interesting, indeed, and speaks for itself.

During the coming heating season, careful tests of the heat emission from these two panels in the same room but of different construction will be made. It will also be possible to determine the heat loss from the reverse side of the panels under actual operating conditions.—D. L. MILLS, Revere Copper and Brass Inc.

TECHNICAL DISCUSSION SPEEDS SOLUTION

I CANNOT refrain from writing a few words of appreciation for Samuel R. Lewis' discussion of radiant heating questions in the October HPAC. A cool and technical analysis of some of the controversial problems, such as given in this article, will no doubt speed up their ultimate solution. It is to be hoped that this discussion finds a great many readers!

There is one point in this article on which I would like to expand, i. e., that of "ceiling streaking" of copper coils embedded in plaster. Many hundreds of such systems, which have been installed along the eastern coast and in the San Francisco and Seattle areas, have been operated for at least one season and often for several heating seasons. Hence, experiences gained with this type of system are presently available.—R. G. VANDERWEIL.

Don't Overlook Importance of
PROPER SIZE LIQUID LINES

EVERY CONTRACTOR RUNS INTO LIQUID LINE TROUBLES

I HAVE READ the article by H. E. Ferrill on liquid line sizing for "Freon-12," published in the October HPAC.

This is a very good article and should have good reader interest because most men emphasize the suction connections and seem to overlook the liquid line sizes, which very often can be improperly designed and cause trouble. Every contractor has run into liquid line troubles at some time or other and therefore too much emphasis cannot be laid on the subject.

At one point in the article, the author, in speaking of the thermostatic expansion valve, said that it "must be supplied with 100 percent liquid refrigerant," and it seems to me he should have mentioned that the reason is that the valve capacity is rated on this basis.

In another place, the author stated that if the expansion valve is not receiving 100 percent liquid, but a mixture of liquid and vapor, that "the entire operation of the system breaks down." In my opinion, it might better be said that in such event "the amount of liquid passing through the valve orifice is less than the valve capacity, resulting in a diminished evaporator performance and likelihood of failure—for no system can give more than the evaporators can produce."—R. C. DOREMUS, Detroit Ice Machine Co.; member of HPAC's board of consulting and contributing editors.

MOVIE AIR CONDITIONING SAVES STUDIOS' MONEY

IT IS WITH much pleasure that I see the excellent work of my very good friend, Louis F. Hess, finally appreciated. I refer to the article on motion picture studio air conditioning in the September HPAC.

Processed Air Important Prop on Hollywood Movie Sets

The 20th Century-Fox Studios have a very good air conditioning system, and it was all planned and developed by Mr. Hess (who, incidentally, though a good friend of mine, is no relation). The Fox studios have economically justified the use of air conditioning many times and I believe that within the next few years there will be a tremendous amount of air conditioning installed in the studios as a result of the fine work that was done at 20th Century-Fox.

I enjoyed the article by Mr. Younkin very much, but do feel that he missed one of the major reasons for the installation of air conditioning in a studio—that reason being that the air conditioning enables a continuous use of the stage while non-conditioned stages must be opened up to the outside and ventilated approximately 20 minutes out of every hour in order to eliminate the tremendous amount of heat generated by the klieg lights that are used in photographing the pictures.

This, of course, means that approximately one-third of the time is wasted and many times, considering the tremendous salaries paid to the directors, actors and technicians, this wastage can run into as high as two or three thousand dollars per minute. Therefore, the saving afforded by air conditioning is a very material one.

Other than that there is little I can say. I thought the article was a good one and very nicely written. —ARTHUR J. HESS, Hess, Greiner & Polland.

DATA SHEET Simplified Procedure for SPECIFICATION WRITING

A Simplified Procedure for Specification Writing, by George W. Campbell, was the title of an article published in the April 1946 issue of Heating, Piping & Air Conditioning. Due to several requests, it was decided to run as a supplement to this article a series of specification cards which are currently being used by the firm of Urdahl and Everetts, consulting engineers, in their Washington, D. C., and San Francisco offices. Mr. Campbell is employed in the Washington office.

The cards have been duplicated by the "Ditto" process. After the original duplication on 8½x11 in. paper, the copies were cut into 5x8 in. cards. The "master" ("Ditto" terminology) was also cut out and filed in a 5x8 card file. The original cards have no dates. As the cards were revised, a date was added so that an obsolete card would not be used.

The cards are in two sections, a lettered series and a numbered series.

Let us assume a specific problem. We have designed a direct fired air conditioning system. We would go to the files and remove card No. A. Looking under paragraph 1, we note general intentions, scope of work, and time of bids. These items should be written on a 5x8 in. card or paper and should be given the numbers noted.

Consulting engineers and architects usually have a permanent set of conditions which they use for the particular locality in which they work covering such items as checking, definitions, delays and extensions, and accompanying drawings. These are included in paragraphs 2-31 indicated as printed matter; if we do not want to use 30 paragraphs for this material we can easily change the number.

Paragraph 32, work to be done by others, is another paragraph that will have to be written out for each job as every job will be different.

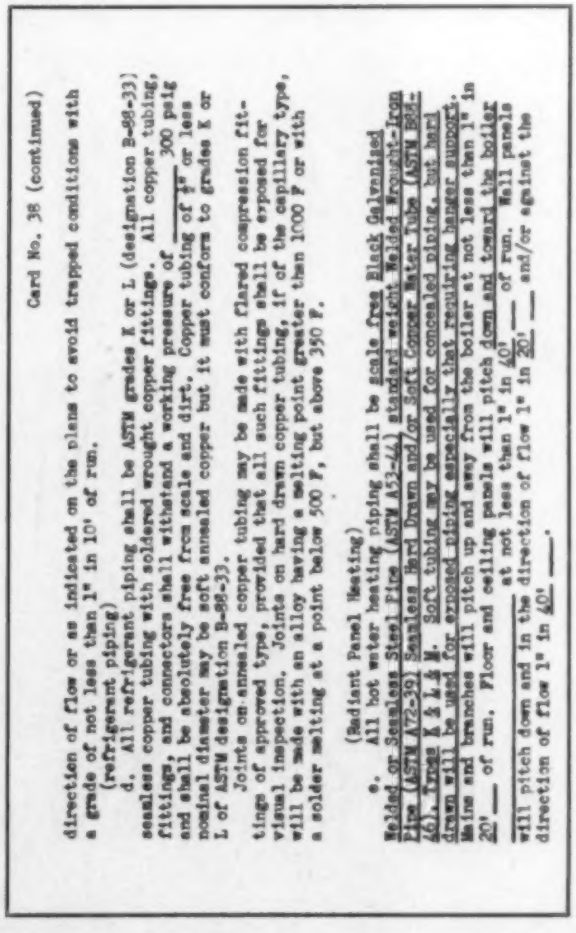
We now have arrived at the part of the system that is a time-saver. We go through the file and pick out all cards having numbers which are listed on Card No. A, following the title of the specification as direct fired air conditioning unit (1), heat exchanger (9), oil burner (11), etc. In our particular problem we won't need some of the cards. Let's assume we are not responsible for the domestic hot water system, which in this case is a plumbing job; therefore, we return card No. 39 (domestic water heater). Again, let us say the architect is to include in his specification all flashing where it is needed; therefore, we return card No. 34 (flashing).

We now take the cards and number them. Paragraph 33 of our specification will be given to direct fired air conditioning unit (Card No. 1), paragraph 34 to fuel oil tank (Card No. 23), etc. Should any of the cards now become separated, that loss will be easily detected when the secretary starts to type them.

After all the cards have been properly marked for the conditions of the particular job, we turn them over to the typist. After typing, the cards can be stapled together and placed in the job file.

The principal advantage of the system is that the engineer is saved time by not having to write out each specification every time it is desired to specify that item, and it eliminates errors which result from trying to transpose longhand. An added advantage is that an individual specification can be changed by substituting the newly written specification using the old number in place of the obsolete cards.

Several of the cards have been published in the June-October issues inclusive, more appear this month, and others will follow. Because of space limitations, they are shown smaller than the 5x8 in. size. These specifications are not to be construed as recommendations to other consultants but to illustrate this card file used by Urdahl and Everetts.



Card No. 38 (continued)

direction of flow or as indicated on the plans to avoid trapped conditions with a grade of not less than 1" in 10' of run.

(refrigerant piping)

d. All refrigerant piping shall be ASTM grades K or L (designation B-88-33) seamless copper tubing with soldered wrought copper fittings. All copper tubing, fittings, and connectors shall withstand a working pressure of _____ 300 psig and shall be absolutely free from scale and dirt. Copper tubing of ½" or less nominal diameter may be soft annealed copper but it must conform to grades K or L of ASTM designation B-88-33.

Joints on annealed copper tubing may be made with flared compression fittings of approved type, provided that all such fittings shall be exposed for visual inspection. Joints on hard drawn copper tubing, if of the capillary type, will be made with an alloy having a melting point greater than 1000 F or with a solder melting at a point below 500 F, but above 390 F.

(Radiant Panel Heating)

e. All hot water heating piping shall be scale free Black Galvanized Welded or Seamless Steel Pipe (ASTM A53-44) standard weight Welded Wrought-Iron Pipe (ASTM A72-39) Seamless Red Drawn and/or Soft Copper Water Tube (ASTM B88-46) Grade K & L & M. Soft tubing may be used for concealed piping, but hard drawn will be used for exposed piping especially that requiring hanger support. Mains and branches will pitch up and away from the boiler at not less than 1" in 20' ___ of run. Floor and ceiling panels will pitch down and toward the boiler at not less than 1" in 40' ___ of run. Wall panels will pitch down and in the direction of flow 1" in 20' ___ and/or against the direction of flow 1" in 40' ___.

Card No. 38
Job No. ___

(cold water and drainage piping)

___ PIPING: a. All piping shall be installed of the sizes and in the locations as shown on the plans. It shall be run parallel to the walls and ceilings in a neat and workmanlike manner.

All valves and accessories shall be installed as shown on the plans, and a minimum of fittings shall be used. The pipes shall be cut to a measured fit, and all threaded piping shall be reamed after cutting.

All piping shall be installed to grade in the direction of flow as indicated on the plans to avoid trapped conditions. In no case will plumbing lines be run with a grade of less than ¼" to the foot.

All cold water, vent, condensate, and condenser water piping shall be galvanized steel Type _ hard drawn copper. This contractor shall furnish and install all water drainage and vent piping required to provide the proper operation and drainage from the equipment.

(steam piping)

b. All steam piping shall be standard weight, scale free steel piping with malleable iron fittings and shall grade in the direction of flow or as indicated not less than 1" in 20' for mains and 1" in 10' for branches. Long runs shall be made with expansion loops, or with swing joints to take care of expansion without misalignment or damage.

(Hot water piping)

c. All hot water heating system piping shall be standard weight, scale free steel piping with malleable iron fittings Type __ hard drawn copper tubing with wrought copper fittings and shall be installed to grade in the

(over)

Card No. 39
Job No. ___

(separate fired)

___ DOMESTIC WATER HEATER: Furnish and install one ____ self-contained mechanically atomizing oil burning gas burning _____ hot water heater unit having a storage capacity of not less than ____ gallons and a minimum generating capacity of _____ gallons per hour with a rise of temperature from ___ F to ___ F. This unit will be complete with automatic controls to maintain a water temperature of ___ F. The burner and unit shall operate on No. ___ fuel oil and shall be supplied from the fuel oil storage tank hereinafter specified under "Fuel Oil Tank". This water heater shall be similar and equal to that manufactured by _____ _____ _____ _____.

Card No. 40
Job No. ___

___ HANGERS AND SUPPORTS: Adjustable pipe hangers (no perforated straps permitted) shall be installed on approximately 6 ft centers and shall line up with adjoining pipe hangers. Hangers for refrigeration lines shall be lined with a strip of gasket rubber not less than 1" in width between the pipes and hangers.

Where piping passes through masonry, wood floors, wood members, or other structure, sleeves and openings shall be of sufficient size to permit the pipe and its insulation to pass through. On uninsulated pipe no portion of the metal shall touch structural materials.

Hangers for supporting the refrigerant suction lines shall not pierce the insulation, but shall be supported from around the insulation, using a sheet metal sleeve of 20 gage metal 6" __ long to distribute the load.

Card No. 41
Job No. ___

___ PRESSURE REDUCING AND RELIEF VALVE: The water supply to the boiler shall be equipped with a 3/4" ____ pressure reducing and relief valve. The drain from the relief valve will discharge over the lavatory _____ _____ in the basement _____ _____. They shall be similar and equal to those manufactured by _____ _____.

Card No. 34
Job No. ___

___ FLASHING: All piping, structural members, ducts, etc. projecting through the roof shall be flashed and counter-flashed in an approved manner with 26 gage galvanized iron 16 ounce copper _____.

Card No. 35
Job No. ___

___ BREECHING: Furnish and install a ___ dia. breeching from the boiler of not less than No. 14 ___ gage U. S. standard black steel with a 12" by 8" _____ hinged cleanout door and also a balancing damper. The breeching shall finish flush with the inside of the flue and shall be rigidly supported with angle braces to the wall.

Card No. 36
Job No. ___

___ REFRIGERANT OIL SEPARATOR: An oil separator shall be installed in the suction line where shown on the plans of a size adequate to handle the capacity of the compressors under full load.

Card No. 37
Job No. ___

(refrigerant)

___ FLEXIBLE CONNECTIONS: Furnish and install flexible connections in the hot gas liquid and suction lines at the compressorg. These connectors shall be made of seamless flexible bronze corrugated tubing covered with bronze braid. The copper and fittings are to be welded or brazed on at a high melting point. They shall be designed for at least ___ 300 psig operating pressure.

(for rubber pad, rubber vibration dampers or spring mountings)

The connections shall be installed in a 90 deg bend with a straight section on each side of the bend and shall be _____ " long.

(for cork or other semi-rigid mounting)

The connectors shall be installed in a straight line or at an angle and shall be ____" long.

Utilizes Btu's in Boiler Water for NIGHT HEATING of Rectory

A stoker fired boiler in the church building supplied steam for one pipe systems in the church, the rectory, the grade school, and the community center building

IRWIN W. COTTON (I. W. Cotton Co., Indianapolis) explains here the method of solving a heating problem that came up when the old hand fired steam boiler serving a church, rectory, school, and community center building was replaced by a stoker fired boiler. Under the hold-fire control, not enough steam was generated at night during moderate weather to keep the rectory at comfortable temperatures. A converter was therefore installed to utilize the heat in the boiler water for the rectory, and the rectory system was changed over accordingly. . . . Radiation in the rectory was based on 140 F water, and the results (including marked fuel economy) have been most satisfactory. They have confirmed the author's long-time conviction that the proper way to heat a building is not to heat it—but just "kill" the cold at every source all the time.

ST. ANDREWS PARISH, Richmond, Ind., had an unusual heating situation that developed during the winter of 1945-46. A new boiler and a new hopper type stoker had recently been installed, replacing a well-worn hand fired boiler. Located under the church sanctuary, this plant supplied steam for one pipe systems in the church, the rectory (which is immediately adjacent and has one wall in common), the grade school 100 ft distant, and the community center building across the street. Church and school load represented nearly three-fourths of the total. The new boiler had proved adequate and the stoker had performed very well, but one important characteristic of the old hand fired system was not equalled by the new.

Under the old operating routine, the fire had been well banked each evening in ordinary winter weather after the needs of church and school for heat were over for the day and their main steam valves closed for the night. In very cold weather this practice was not followed; night fire was maintained and all buildings kept above freezing.

Under the banked fire operation prevailing all other nights, enough vapor was generated to keep the rectory comfortable until quite late—also the small community building on the two or three evenings it was used each week.

Rectory Cold on Moderate Evenings

Stoker operation was highly satisfactory in other ways, but failed to meet this important requirement. When placed on the maximum hold-fire setting for the night there was not sufficient vapor produced to reach the radiation in either the rectory or the community building. Schedules for the latter could be modified to meet the situation reasonably well, but the rectory needed to be warm every evening of the week. Paradoxically it *was* warm in bitterly cold weather when night fires were kept going, but was cold on moderate evenings.

Reverend C. O. Bosler, the pastor, considered enlarging the stoker hopper and operating under pressure control later each evening, but was reluctant to prolong the firing of the big boiler to benefit such a small part of the total system—such practice being sure to increase fuel consumption. He thought of separating the rectory heating system from the main plant and installing an oil or gas fired boiler to care for it alone, but had to give up the idea because such equipment was not then available.

It then occurred to him that he had a big boiler full of hot water always available and that there should be some way to use it to heat the rectory. He requested his heating adviser to consider whether

something could be worked out along such lines, and a method was eventually adopted to utilize this stored-up heat.

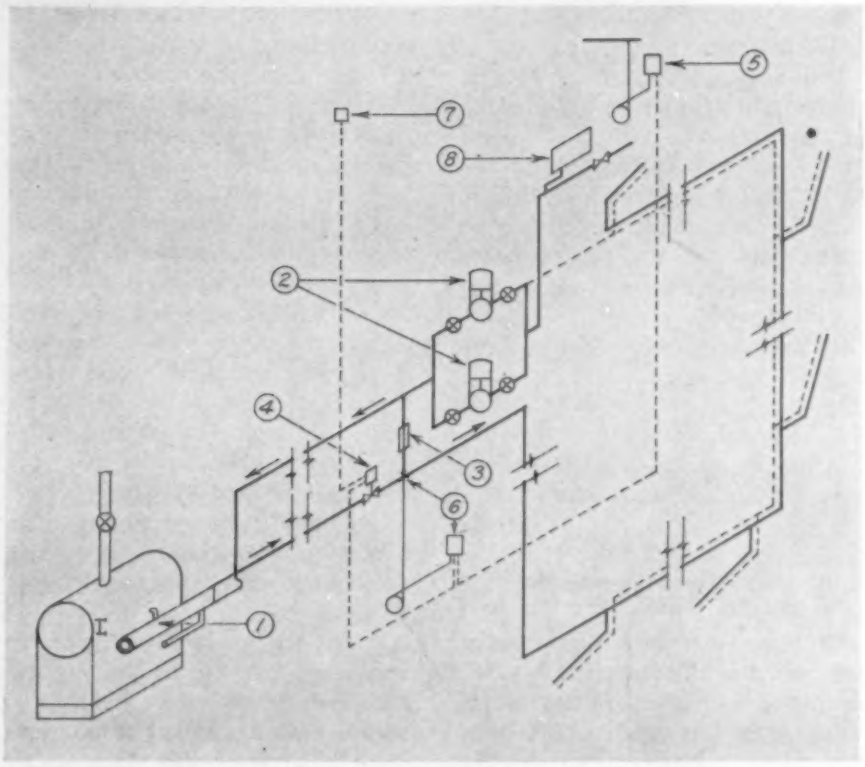
Data sheets disclosed the volume of water in the boiler, and the Btu input of the stoker operating under hold-fire was calculated. Excellent insulation prevents much radiation loss, and it was estimated that with the volume of water near boiling temperature to begin with each evening, plus the heat added by the stoker hold-fire during the night, there would be enough heat to keep the rectory at the daytime temperature during the evening and at a comfortable lower temperature during the night. Loss of boiler water temperature during the coldest nights of this kind of operation—keeping in mind that the boiler is fired all night in very bitter weather—was estimated at 60 to 70 F.

Heat Transfer Converter Below Boiler Water Line

A hot water heating plant for the rectory, using a heat transfer converter below the boiler water line as the heating element, was thus indicated as being the logical answer to the basic problem. No late firing by the custodian would be required, for the rectory could be warmed "coasting" on the stored-up heat which was of sufficient volume to do the job nicely. A few minutes earlier setting for the stoker morning warm-up would compensate for the lowered water temperature in the boiler.

The converter was installed just below the water line, with full sized top and bottom connections into the boiler to operate with gravity circulation if possible. (Unions and valves were provided for quick installation of a circulator if necessary, but did not have to be used.) The steam main from the boiler header to the rectory was disconnected and converted into a hot water main, piped to the top connection of the converter. A new return was run from the bottom converter connection into the rectory basement, paralleling the main, and a system of return main and branches installed there.

Conventional city water connection, pressure tank, regulating and relief valves were placed in the rectory basement room adjacent to the church basement, and two circulators were installed with valved headers to permit operating one at a time, alternating periodically to give equal wear, and sized and powered for continuous operation.



A heat transfer converter below the water line of the steam boiler was installed to utilize the stored-up heat of the boiler water for heating the rectory. 1, converter; 2, circulators, used alternately to equalize wear (one runs continuously when it is in use); 3, heavy check flow control valve in bypass; 4, positioning motor valve in hot water supply main; 5, thermostatic adjuster with outdoor bulb-piloting; 6, positioning type immersion thermostat with bulb in hot water main; 7, positioning type room thermostat used as high limit; 8, city water pressure regulating and relief valve and pressure tank

Flow Control Valve in Circulator Bypass

Control for circulating water in the rectory system at proper temperatures, utilizing source water entering the system at widely varying temperatures, was effected by installing a "heavy check" flow control valve in a bypass from the circulator discharge to the supply main, with a proportioning valve in the supply main between the converter and the bypass connection. No hot water from the converter can enter the system when the proportioning valve is closed, the flow control valve opening to bypass full volume at such times.

Movement toward or entirely to the open position by the proportioning motor valve introduces hot water in volumes ranging from seepage to full. This method was chosen to insure no seepage of hot water under constant circulation, when controls call for "heat off."

The proportioning valve was wired under direct control of a proportioning type immersion thermostat installed in the supply main, which in turn is piloted by an outdoor thermostatic adjuster designed to keep the radiator temperatures constantly in accordance with outdoor weather conditions.

The adjuster was set for a hot water temperature of 140 F in zero weather, calibrated at 70 F outdoor air temperature and 70 F water, with water temperature raised 1 deg for each degree drop outdoors.

Adjustments were made to provide adequate heat under the worst conditions—high winds and no sun. To prevent overheating in quiet sunny hours, a proportioning type room thermostat was installed to act as a high limit by closing the proportioning valve and bypassing the water around the system continuously without heat being added at times when the outdoor control

would be calling for more heat than needed.

The unique feature of the job is the utilization of the stored-up heat in the water of the boiler instead of steam from the boiler. Somewhat similar applications of converters have doubtless been made many times but the fact that use had to be made in this instance of a wide range in source water temperatures led to a further unique feature. No claim of anything actually "new" is advanced for this job, but the combination of the two "uniques" might very possibly classify the entire installation as a "first".

Radiation Requirements Based on 140 F Water

This second feature capitalizes on the fact that the radiation requirements were based on the 140 F water. This was done to reduce air movements resulting from concentrations of heat in the occupied spaces.

It was decided to use baseboard radiation in the larger rooms. The actual baseboard type was unobtainable in time to use on this job, so fin pipe was installed along the base of the rooms. Fr. Bosler had recently purchased excellent storm-sash for all windows, so the heat loss was expected to be fairly uniform at all points along the outside walls and it was not considered necessary to double strand the fin pipe under the windows.

The 2 in. size available fit the load distribution requirements nicely, just about covering the outside wall spaces without leaving any large gaps and also without much overlapping onto inside walls. Operating results indicate that the convection fins provide a slow "rise" of warmth at the base of the outside walls, sufficient to overcome cool air "droop" to the floor; and since there is constant tempering of the water temperature in exact accordance with outdoor changes, this balancing of cooling droop with rising warmth occurs constantly throughout all changes in outdoor temperature.

There are no hot spots and no cold spots, very little temperature difference between floor and ceiling, and any air movement is too moderate to be perceptible.

When the final design of the system was approved by Fr. Bosler and installation started, it was predicted that effective comfort could be maintained with lower temperatures than previously. This proved to be the case. Formerly, the building had to be heated to 75 to 76 F, there were drafts in several rooms, and hot spots in all of them. With the new installation, 72 F is ample, and the high limit thermostat is set at that point for daytime and evening and somewhat lower for night.

Lowering the room temperature has had another beneficial effect. Evidently the slight reduction in the dryness of outdoor zero air heated to 72 F inside (as compared with 76 F) is sufficient to represent a real improvement—that being one of the points particularly commented on by Fr. Bosler and his assistants. Probably the reduction in air movement is a factor comparable to the bettered humidity situation in attaining this feeling of reduced "harshness" in the air, due to reduced evaporation from the skin.

The system was operated throughout the 1946-47 heating season. Fr. Bosler gave instructions that the boiler was to be fired to take care of the church and school, with no special provision of any kind made for the rectory unless specifically requested. No request had to be made; the rectory was warm every 24 hr period of the heating season.

Marked fuel economy was attained. Apparently a considerable amount of extra firing had been required with the old job to keep the rectory warm—at least such would be the inference from the fact that the reduction in coal used in 1946-47 was considerable as compared with the full season of stoker operation the previous year, the two winters being comparable in degree-days, and this being the only change in the heating system with no change in load or operating schedules.

When the stoker fired boiler replaced the old hand fired unit, not enough steam was generated under hold-fire operation at night to heat the rectory in moderate weather. Use of the stored-up heat in the boiler water was therefore decided upon, and has solved the problem

Don't Heat—Just "Kill the Cold"

Experience of the building's occupants and visitors has substantiated the claims made for many years for low temperature hot water heating; it has also substantiated the claims made for even distribution of warmth. The type of control, which constantly and exactly counteracts the building heat losses, also contributes to the success of this system.

It has strengthened the author's conviction of many years that the ideal way to heat a building is *not* to *heat* it—just "kill" the cold at *every* source *all* the time, and the building will *stay warm*.

Heating, Piping & Air Conditioning

AMERICAN SOCIETY of HEATING and VENTILATING ENGINEERS

Journal Section

A Method of Fire Control

By A. C. Bartlett*, Boston, Mass.

SUMMARY—A description of a method of controlling fires in multi-story buildings. The fire is confined to the floor on which it is started. Smoke, gases, and flames are prevented from spreading through Escalator openings and the Escalators can be used as a means of escape. The fire control system consists of the combination of a separate exhaust system producing a negative pressure in the vicinity of the fire and a water curtain for cooling the gases when the fire is located adjacent to an Escalator

RECENT disastrous fires, such as Boston's Cocoanut Grove and the Chicago and Atlanta hotels, have started a wave of building code revisions. As would be expected, complete enclosure of all stairways, elevator shafts and moving stairways, or Escalators, to prevent the spreading of fire from floor to floor of a building seems to be in the minds of most of the code authorities.

Since the enclosure of Escalators in department stores detracts materially from the value of the device to the store owner, it was desirable to devise a method of fire control which would prevent the spread of fire in a multi-story building through floor openings but which would not require complete enclosure.

An experimental building 70 ft long by 30 ft wide, two stories high was constructed and two mock Escalators were built in, one above the other, to simulate an actual installation. Experiments were then conducted in the building with various arrangements of sprinklers in an attempt to confine fire to the first floor. Fairly satisfactory results were obtained with high velocity jets spraying directly down the Escalator ramp, completely filling the wellway with high velocity spray.

It was found, however, that after fires had been burning for some time on the first floor, bursts of hot air and smoke came up the wellway through the high velocity water jets. It was then realized that in order to be effective, any system devised should reduce the pressure in the space where a fire occurs and should remove the smoke and toxic gases produced by a fire.

A system was therefore developed combining the use of an exhaust fan to reduce the pressure in the fire area by removing the overheated air and smoke, and a water curtain around the wellway to cool and reduce the volume of the gases. Such a system is not a fire extinguishing system. It is, rather, a method of controlling fire by confining it to the floor on which it occurs until the fire department arrives. This permits people in the building to escape and prevents panic. Before explaining the operation of the system of control, consideration should be given to the action which causes fire to spread from one floor to another.

When a fire starts, it begins to heat the air in its immediate vicinity. Since hot air occupies more space than cool air, there is an increase in pressure in the area and this pressure becomes greater as the fire progresses. It causes a flow of smoke, gases and hot air to areas

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Fig. 1—Barrier duct around ceiling opening

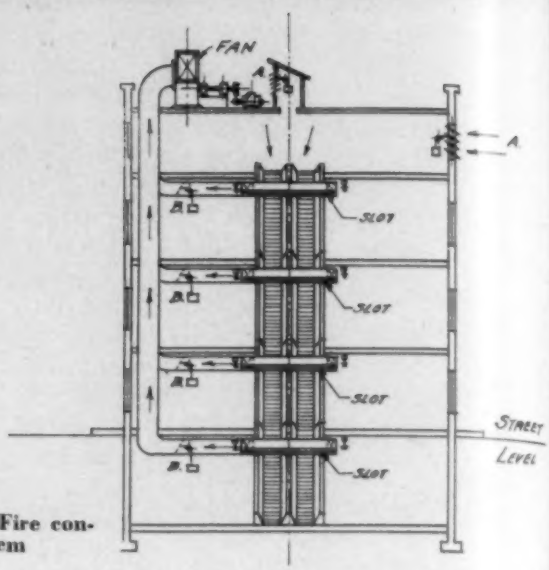


Fig. 3—Fire control system

of lower pressure. In addition, the hot air, smoke and gases tend to rise and seek passage upward through any opening such as stairways, Escalators, etc. that may be available. If the pressure and temperature continue to rise they reach a point which corresponds to the ignition point of some of the material or goods in the structure. The simultaneous ignition which takes place is what is usually termed a hot air explosion.

Smoke and toxic gases spreading from floor to floor as a result of pressure and temperature are the principal causes of panic and death. It was recognized by the investigators that any scheme of fire control must eliminate these panic and death dealing agencies to the greatest extent possible, and prevent them from spreading throughout the building.

The total enclosure of Escalators does not seem to be the answer to the problem of confining the fire because an enclosure of this type is not gas tight. The enclosure acts as a natural flue or stack through which the smoke and gases tend to rush and spread in mushroom shape on the upper floors. If there is a vent in the top of this stack, some of the gases escape through it for a while, but if the fire becomes intense, the flow of gases becomes too great for the vent opening. Pressure develops in the top of the well and the gases spread out or escape through any available crack or opening. The fact that enclosure doors are not too tight and may be opened in spite of instructions to the contrary, only increases the danger.

The investigators found that a method of keeping the fire entirely on the floor where it occurred was a combination of an exhaust system to remove most of the smoke and gases and to produce a negative pressure in the vicinity of the fire, with a water curtain to cool the gases when the fire started near or approached too closely to the Escalator. Such a system would cause fresh air to flow from adjacent floors to the floor where the fire was rather than vice versa.

When the system described is equipped with a fan of proper size, a large fire can be maintained on one floor, an actual downdraft can be maintained through the Escalator openings, and the Escalator can even be used as a supplementary means of egress. The effectiveness of this system has been demonstrated to fire department officials, representatives of the *National Fire Protection Association*, and many others.

The system as described in this paper is simple and reasonable in cost. The principles employed are shown in Figs. 1, 2, 3 and 4. A collection duct, Figs. 1 and 2, forming a barrier is placed at the ceiling around the entire opening to be protected; this duct has a continuous slot at the outside bottom corner, through which a high velocity is maintained to collect all smoke and gases which attempt to pass down and around it. A branch duct, see Fig. 3, leads to a vertical riser which conveys the smoke and gases to a fan located on the roof or in the attic of the building. The fan discharges out-of-doors.

In a multi-story installation there must be a shut off damper (see B in Fig. 4) in each of the branch ducts; all dampers being normally closed, and arranged so that only the one on the floor where a fire occurs will open in the event of a fire. Further, an opening (see A in Fig. 4) must be provided on the uppermost floor served by the Escalators. This will open in the event of a fire, on any floor, and admit fresh air which will be drawn downward through the opening to the floor where the fire occurs.

The operation of the system and sequence of control in case of fire is as follows:

Referring to Fig. 3, assume that a fire starts on the second floor. The action of a flow switch, a heat sensitive device, or the pressing of a push button causes the following actions to happen simultaneously:

1. The exhaust fan starts.

2. The fresh air intake (A in Fig. 3) opens.

3. Shut-off damper (B in Fig. 3) on the second floor only opens.

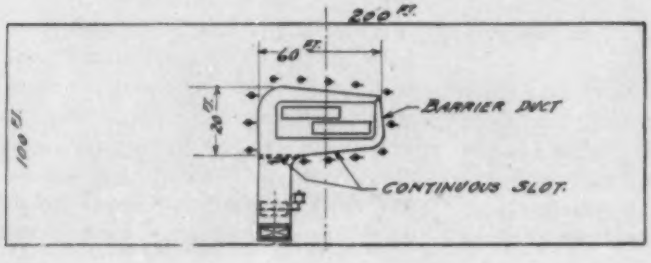


Fig. 2—Barrier duct, top view

4. The Escalator stops.
5. All ventilating or air conditioning apparatus stops.
6. The fire department is notified.

When the system has been started there will be an inward flow of air at A (Fig. 3). This will flow down through the Escalator openings to the second floor. Smoke and gases from the fire will spread over the ceiling of the second floor, and in attempting to pass around the barrier duct, will be drawn in by the high suction in the slot. There will also be an air motion of not less than 150 fpm up through the Escalator opening from the first floor and it will be found that the fire can be confined to the second floor—at least until people have had a chance to escape from the building—and the fire department has arrived to take over.

If the fire reaches sufficient intensity to create a temperature of about 135 F near the Escalator opening, it sets off a pilot sprinkler that opens a valve supplying water to the open water curtain heads and a curtain of water surrounds the entire opening.

From the foregoing description of the operation of this system, it can be seen that it provides for the removal of smoke and gases from the area where a fire occurs, and prevents their spread to floors above the fire with the consequent danger of panic and death. It also confines the fire to the floor on which it starts and makes it possible for the fire department to fight it both from below and above with comparative safety; and it relieves pressure normally set up by a fire, thereby decreasing the danger of so-called hot air explosions.

Generally, the system must be installed as a separate system in order to avoid complications that would result if it were incorporated in an air conditioning or ventilating system, and it should be inspected and tested periodically to make sure that it is in good operating condition.

The exhaust fan motor and the control devices to open dampers and to stop Escalators and air conditioning systems must be wired independently of other apparatus in the building and this wiring should be installed in accordance with the *NFPA* code for the wiring of fire pumps.

The principal function of the exhaust system in the method of fire control described is to create a negative pressure in the area where the fire occurs, thereby causing a downdraft through the ceiling openings of sufficient intensity to prevent smoke, hot air and gases passing up to floors above.

Engineering Information for Exhaust System

From observation it has been determined that a downdraft velocity of 300 fpm average across the opening is sufficient. However, in order to select a fan of sufficient size to create this velocity several factors must be taken into consideration and possibly the effect of these factors is best illustrated by a specific example. The example applies to an intermediate floor, in a multi-story department store, having two moving stairways, one up and one down; having a nominal opening perpendicular to the treadway of 36 sq ft; a floor area of 20,000 sq ft; and the clear height 15 ft.

The fan capacity should be determined somewhat in the following manner:

Volume required by opening $..36 \times 2 \times 300 = 21{,}600$ cfm

Volume required to offset infiltration[a] $\dfrac{20{,}000 \times 15 \times 1}{60} = 5{,}000$ cfm

Volume required to offset updraft through opening from floor below[b] $.....36 \times 2 \times 150 = 10{,}800$ cfm

Volume required to offset heat of fire, say 10 deg. $300{,}000 \times \dfrac{540}{530} - 300{,}000 = 5{,}660$ cfm

Required fan capacity in cfm $.....43{,}060$ cfm

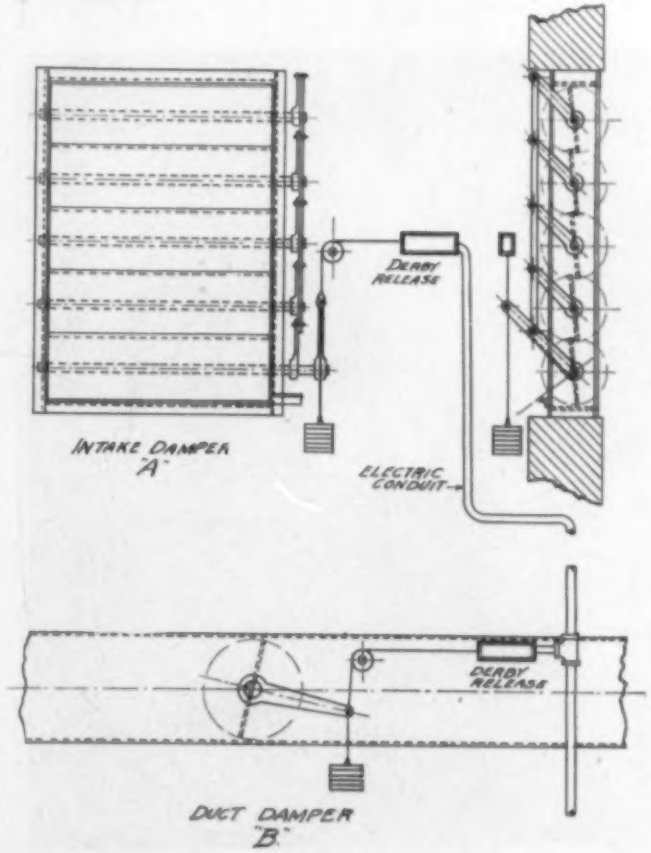
Approximate fan capacity in round figures $..... = 45{,}000$ cfm

[a] Infiltration based on one air change per hour may be more or less depending on volume of space and building construction.
[b] From normal updraft observed from many installations.

The air should be exhausted through a continuous slot in the lower outside of a duct completely surrounding the ceiling openings as shown in Fig. 1; the duct forms a barrier around which smoke and gases must flow before reaching the openings.

To determine the width of the slot it is necessary to assume a velocity through it, found to be about 2000 fpm as an optimum.

Fig. 4—Control for intake and duct dampers



In Fig. 2 it will be noted that the barrier duct has a perimeter of approximately 160 ft. The area of the slot required at 2000 fpm velocity is $\frac{45000}{2000}$ = 22½ sq ft assuming 100 percent effectiveness of slot area, but since only about 90 percent effectiveness can be expected, the area required will be $\frac{22.5}{0.90}$ = 25.0 sq ft. The slot width required will be $\frac{25.0 \times 144}{160 \times 12}$ = 1.87 in.

The resistance against which the fan must operate depends largely on the velocity maintained in the ducts and an approximate method of figuring will be given. Assuming a velocity of 2000 fpm in the slot, 2000 fpm in the barrier duct, 3000 fpm in the branch duct and 4000 fpm in the riser (assumed as 100 ft long in a six story building) computations are made as follows:

Barrier duct 80 ft long $\frac{22500}{2000}$ = 11.25 sq ft area equivalent to 4 ft diameter circle

Branch duct 40 ft long $\frac{45000}{3000}$ = 15 sq ft area equivalent to 4.5 ft diameter circle

Riser 100 ft long $\frac{45000}{4000}$ = 11.25 sq ft area equivalent to 4 ft diameter circle

Assuming one velocity head loss in 60 equivalent diameters the pressure loss in the system will be as follows:

Fig. 6—Smoky condition of first floor one minute after ignition

Fig. 5—Operator lighting a fire

	In. Water
In slot - - - $\left(\frac{2000}{4000}\right)^2$ - - -	= 0.250
In barrier duct $\frac{80}{4} \times \frac{1}{60} \times \left(\frac{2000}{4000}\right)^2 \times \frac{1}{3}$	= 0.029
In branch duct $\frac{40}{4.5} \times \frac{1}{60} \times \left(\frac{3000}{4000}\right)^2$	= 0.082
In riser $\frac{100}{4} \times \frac{1}{60} \times \left(\frac{4000}{4000}\right)^2$	= 0.420
Negative pressure on floor - -	= 0.025
Total computed resistance - -	= 0.806
Add 50 percent safety factor	= 0.40
Total - - - - - - - -	= 1.206

Select a fan having a capacity of 45000 cfm against a static pressure of 1.5 in. water column.

The exhaust system should be designed with full radius elbows wherever possible and no duct turns or any other construction features which might possibly become an obstruction in years to come should be used; the ducts should be of heavy gage iron, not lighter than No. 18 U.S. standard gage or preferably No. 12.

A weighted shutoff damper must be placed in each branch duct. The damper should be held in the closed position by a Derby release (See

Fig. 7—Fire, smoke and gases passing through opening one minute after ignition

Fig. 4) or similar device which will be tripped in case of fire by one of the various controls.

The fresh air opening should be located on the uppermost floor served by the moving stairways, either on a side wall, or on the roof in case the stairway goes to the top floor. It should be fitted with a louver damper held closed by a Derby release to be tripped by the control and should be opened by a weight hung on a lever. The opening should have a free area sufficient to admit an air volume equal to 75 percent of the fan capacity at a velocity not exceeding 1000 fpm.

Control Equipment

The control of the system is really divided into two parts, that which operates the exhaust equipment and that which operates the water curtains around the escalator openings.

In a building completely equipped with sprinklers, as is standard in most department stores, the opening of any automatic sprinkler anywhere in the main floors starts the exhaust fan; opens inlet damper A (Fig. 3) and the exhaust damper B (Fig. 3) at the ceiling of the floor where the fire has occurred; stops the Escalators; stops operation of the air conditioning system; and turns in a fire alarm. All this is accomplished electrically by connections to flow switches inserted in the automatic system supply pipes at appropriate places. In many cases this may be all the equipment that will operate, unless there is need for operation of the water curtains around the Escalator openings.

If, however, the fire should start near the foot of an Escalator, or if heat waves from a more remote fire should approach the Escalator, because early control of the fire by the automatic sprinklers has been hampered by such obstructions as showcases, etc., pilot sprinklers, placed around the ceiling opening of the Escalator and located just outside the air duct, operate at 135 F to trip a deluge valve. This valve then supplies water to the open sprinklers forming the water curtain around the ceiling opening and just outside the exhaust ducts. It is this water curtain that cuts off flame and heat and a considerable amount of smoke from going up the Escalator, and yet it is so located around the Escalator that in an emergency, passage up and down the Escalator is relatively unobstructed. This curtain also serves to cool the exhaust ducts in the vicinity of the hot gas entrances.

The open sprinklers forming the water curtain are of ⅜ in. size, and

Fig. 8—Appearance of Escalator following ten seconds of fire control operation

are spaced about 4 ft apart. Standard 135 F automatic sprinklers are used for pilot sprinklers, and there should be a minimum of one on each side and end of the ceiling opening.

Heat sensitive devices of various types may, if desired, replace the pilot sprinklers for the control of the deluge valve which supplies the water curtain. The extreme sensitivity of some such devices, however, is not needed, and is possibly not even desirable. The simplicity of the pilot sprinkler type of operation is an advantage.

The supplementary activities initiated by the operation of any automatic sprinkler in the regular sprinkler system may be supplemented, if desired, by the operation of smoke detectors or thermostats. In a building not equipped with sprinkler systems smoke detectors or thermostats may be used to control the exhaust fan. The automatic water curtain, however, is included in the complete equipment.

It will be preferable to add a manual break glass type of box at each Escalator and at each floor level to allow for manual operation of the system. Such a manual box will perform all the functions already listed as being initiated by the opening of the first automatic sprinkler. Concealed or locked test switches appropriately located should be included for the periodic testing of the exhaust system, damper control and Escalator controls. In any city where central station sprinkler supervisory service is available a connection to this service should be a part of this system, and in such a case the test switches should be a part of central station service equipment, and the periodic test program should be carried out as a part of the central station supervisory service.

To determine the effectiveness of the system in the test building a fire was created by burning alcohol in two 5 x 3 ft pans, two 2 x 2 ft pans, two salamanders filled with dry kindling wood and a large pile of oil soaked waste. Additional smoke was created by the ignition of 18 to 24 smoke bombs. The starting of the fire is shown in Fig. 5. Fig. 6 shows the condition on the first floor one minute after ignition, and Fig. 7 shows smoke and gases coming up the wellway at the same time. Temperature readings from thermocouples located on the first floor ceiling, north and south, showed an average of about 230 F. Half way up the Escalator the temperature was 220 F; the second floor temperature was 80 F. Immediately after the protection was started the temperatures in the respective locations were 160 F, 80 F and 80 F; a downdraft in the well was created and conditions as shown in Fig. 8 were established.

Realizing that the engineering of such a system is in the field of the heating and ventilating engineers, the foregoing information is given in the hope that those engineers who encounter the problem of fire control in multi-story buildings may know what can be done in the interest of human safety.

Acknowledgment

The author makes grateful acknowledgment to the Otis Elevator Co. and the Westinghouse Electric Corp., Elevator Division, who sponsored the experiments on which this paper is based, and to the Grinnell Co., on whose proving grounds the building was erected and who cooperated in the supplying of sprinkler information, equipment and the running of tests.

FORMATION OF ENGINEERS CLUB OF WASHINGTON

Recent events in the formation of the Engineers Club of Washington, D.C. have proved that there has been a definite need for a club where engineers specializing in different fields could meet and discuss problems of common interest. Over 900 engineers have responded to the opportunity for charter membership, and many members of various engineering societies have signified their interest in this project.

The first organized meeting of the club was held on January 18, 1946 at the instigation of the Washington, D.C. chapter of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. At this time, 24 engineers representing various local chapters of different engineering societies met and elected a chairman and secretary. Committees to investigate the already existing Engineers Clubs in other cities and also to investigate buildings which would be suitable for a club home were appointed.

The second important step in the formation of the club occurred in October, 1946, when regular monthly club luncheons were instituted and a Constitution and By-Laws Committee was appointed. After many months of activity, during which time the report of the organizational committee concerning qualifications for affiliation and rules governing charter membership were accepted, the *Articles of Association* for the club were unanimously passed, and the Club was incorporated under the laws of the District of Columbia on July 31, 1947.

During these months, interest in the Club steadily increased, and it is believed that response to the future meetings will undoubtedly place the Engineers Club of Washington well on its way toward taking a recognized place in the Nation's Capital.

CONTRACT AWARDS GAIN SHARPLY

Sharp gains in contracts awarded in August for construction in the 37 states east of the Rocky Mountains have been reported by the F. W. Dodge Corp.

Particularly significant, a spokesman for the corporation said, was the fact that the August total of $823,216,000 was greater than the total for July or for June, thereby establishing a uniquely heavy contraseasonal upward trend.

The August total was 25 percent greater than that for July and 21 percent greater than that for August last year.

The August volume of contract commitments was higher in all major classifications of construction than in July or in August of last year. Nonresidential building showed a gain of 15 percent over July and 37 percent over August 1946. Residential volume was up 28 percent over July and 9 percent over August of last year, while public works and utilities contracts showed gains of 35 percent over July and 21 percent over August of 1946.

Design Method for Panel Heating Systems Using Copper Tubing

By R. G. Vanderweil*, Woodbury, Conn.

SUMMARY—A simplified method of designing panel heating systems has been developed by limiting design to typical building and panel construction and providing tables from which panel design data may be read directly when the construction and required heat output are known.

IN MAKING a study of available computation methods used in the design of radiant heating systems, it was found that the method first suggested by Dr. F. E. Giesecke[1] offered a relatively simple solution. His method gave the heat output of panels located in rooms of known mean air temperature and unheated MRT (mean radiant temperature) and was found to be sufficiently accurate in a series of tests[2] performed under varied room temperature conditions. This method was also checked by the author in tests of actual heating systems.

Measurements of 10 floor and nine ceiling systems indicated that the errors arising from the use of this method were well within the practical limits of accuracy which are governed essentially by the precision of the room heat loss calculations.

The heat flow patterns in the panel have previously been treated by test and analytically[3] by Dr. William Whitmore and the author. The method outlined in this paper was based on the findings and equations of this source, since no other coordinated results were available.

In order to be able to prepare a simplified design method it is necessary to make certain assumptions and to restrict design to typical building construction as outlined.

Restrictions and Assumed Standard Conditions

The panel output was rated for systems operating in rooms heated to 70 F air temperature, as is customary for systems employing radiators and convectors. Each panel structure was rated for three panel outputs, the ceiling structures for instance, for 50, 60, and 70 Btu per (hr) (sq ft).

Tube diameter, tube spacing and water temperatures were restricted so as to result in the *most economical coils* as shown in Table 1. Actually the design for economy was restricted by practical considerations such as selection of smallest available tube size to result in pressure drops that could still be handled by standard circulators, and selection of tube spacing sufficiently small to result in uniform panel surface temperatures.

In buildings heated by both ceiling and floor panels it was found that satisfactory results could be obtained when the operating water temperature of the floor system was slightly in excess of that computed, if the control cycle were operated from a thermostat located in a ceiling-heated room. In order to enable the designer to combine ceiling and floor panels in one system, additional design data are supplied in Table 2 for ceilings supplied with water of low mean temperature. More costly panels will result when designed from values given in Table 2. When combining ceiling and floor systems, one surface should be used merely as an auxiliary (*e.g.* supplementary floor strips under a picture window) and each coil must have its own balancing valve.

The temperature drop of the water in the coil again was limited by the requirements of uniform panel surface temperatures.

Structural Restrictions

Only the most common building constructions were considered. Each of the nine types shown in Fig. 1 include one or several of these common structures. Type A of Fig. 1 refers to all concrete structures such as *metal pan*, open steel joist systems etc., with air space and hung ceilings below. Where 1-C in Type A indicates linoleum flooring, lines or coil number 1-C of Tables 1 and 2 apply; with single or double wood flooring, the data in lines 2-C must be used.

Type B of Fig. 1 shows similar panels but without air spaces and with different types of floor covering; Type D shows a *filler-block* system and Type E the standard frame structure. Type G includes all insulated ceiling panels, *i.e.* frame or masonry structure, conforming to the specified quality of insulation. All ceiling coils are fully embedded in gypsum plaster and the designations 1-C, 2-C, 3-C of Fig. 1 refer to the coil numbers to be used in Tables 1 and 2.

Types H and K show intermediate floor coils; while L and M show ground floor coils of variable floor covering. L and M can be used only where the base slabs are properly insulated by dry gravel, etc. All floor coils are fully embedded in concrete. 1-F to 3-F again refer to Table 1.

Design Procedure

All data required for the most economical coil design are found in Table 1. Fig. 1 may be considered as an index to column 1 of this table. Assuming as an example, a two story frame structure and a coil embedded in the first floor ceiling, the proper *coil number* may be found in Fig. 1. The structure under consideration is shown under Type E and the sketch in turn refers to coil number 2-C of Tables 1

*Member of ASHVE.

[1] Radiant Heating and Cooling. How to Figure Total Heat Delivered by Panel and How to Calculate Pipe Coil Size, by F. E. Giesecke, (*Heating, Piping & Air Conditioning*, August 1940, p. 484.)

[2] Measurement of Heat Output of a One Square Foot Panel, by R. S. Leigh and R. G. Vanderweil.

[3] Chase Radiant Heating Manual 1946.

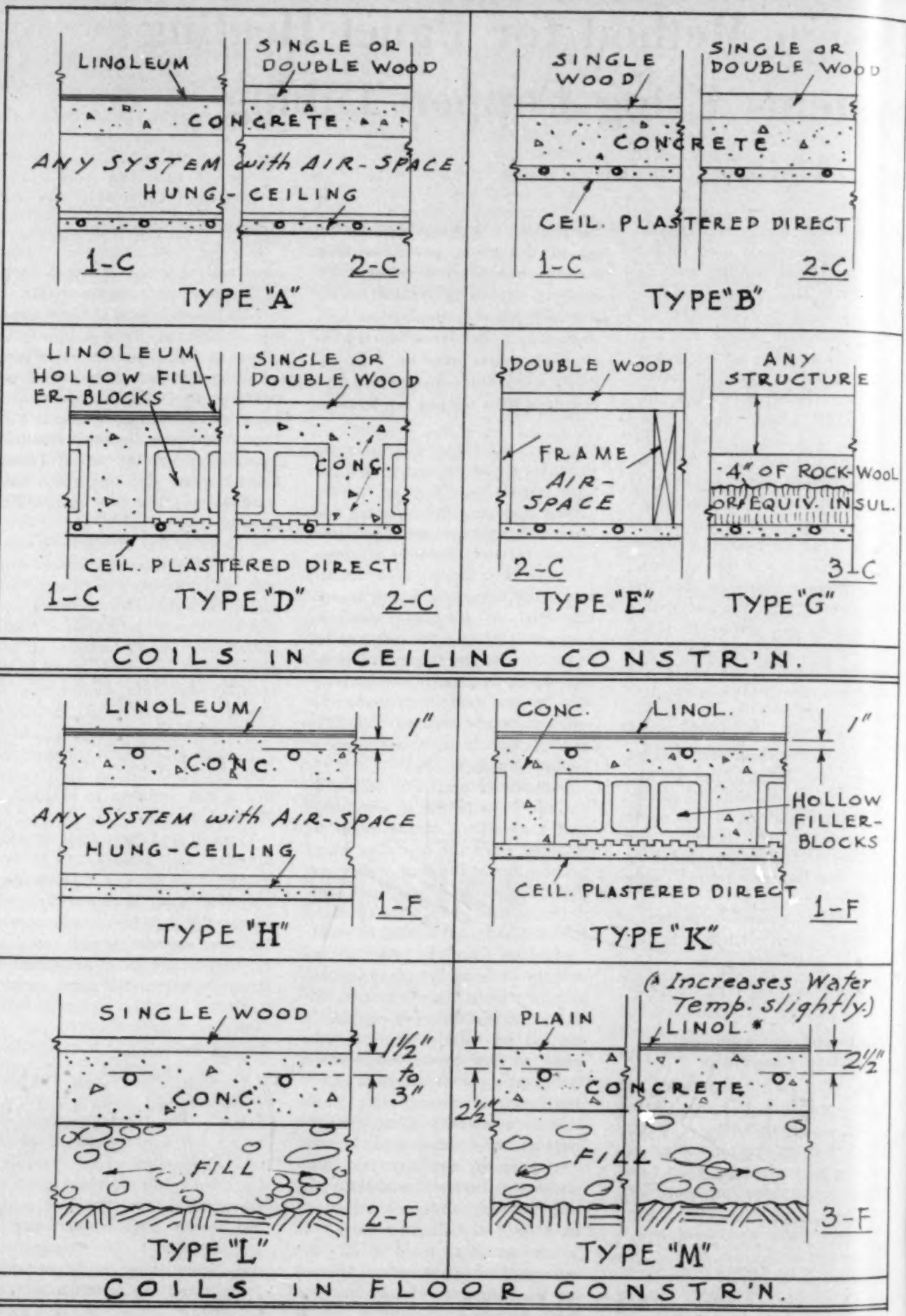


Fig. 1—Typical building construction details for panel heating systems

or 2. Now the design proceeds as follows:

1. The individual room heat losses are computed according to the HEATING, VENTILATING, AIR CONDITIONING GUIDE or other equally accurate methods. Heat losses through the areas containing the heating coil should be excluded.

2. The first step in panel computation is to determine the required panel output Q_1, Btu per (hr) (sq ft). This is obtained by dividing the individual room heat losses by the available panel (floor or ceiling) area. Assuming that Q_1 for one room was found to be 53 Btu per (hr) (sq ft), the next higher value of heat output, 60, is selected in Table 1. The panel area is reduced accordingly, that is, to 53/60 or 88 percent of the available panel area.

3. Find panel heat loss, coil dimensions and temperature drop. If coil 2-C is to be used for structure Type E, of Fig. 1, follow line 2-C, 60 in Table 1 for a unit output $Q_1 = 60$. The panel heat loss (column 3) is $Q_1{}^L = 14$ Btu per (hr) (sq ft) and the coil design, ⅜ in. nominal tube using 150 deg mean water temperature and placed 6 in. on centers (columns 5, 8, and 9). The recommended temperature drop of the water in the coil is 30 deg (column 6). The inlet water is then $150 + 30/2 = 165$ F at design outside temperature.

4. Maximum panel size and flow in coil. The available pump head restricts the panel area. Column 10 Table 1 gives the maximum allowable panel area for systems using standard pumps, and column 11 for high-velocity circulators. It was assumed in preparing column 10 that, of an available 5 to 6 ft pump head, 3.3 ft are consumed in the panel and connections and the remainder is lost in the main piping and risers. With high velocity pumps of 9 to 11 ft head, 7.5 ft may be dissipated in the coil and connection (column 11) and, therefore, larger panel areas are allowable.

In order to determine pipe sizes, the flow requirements of the individual panels must be known and are found by multiplication of the actual panel area in square feet by the unit panel flow given in column 7, Table 1 where F = 2.47 lb per (hr) (sq ft panel). Note the relationship between panel area and coil area: the overall centerline dimensions of the coil area are obtained by subtracting one tube spacing (the distance between two tube centerlines) from each panel dimension—length and width.

5. When using Tables 1 or 2 the restrictions in columns 4 and 12 should be noted. Column 4 indicates whether the space above the ceiling or below the floor panel is heated or not. Column 4 in the case of *panel 2-C* indicates H or *heated above*. If the space above is unheated (U_a) insulation must be added and coil number 3-C must be used (see also Fig. 1, Type G).

Column 12 indicates restrictions on the allowable maximum output per square foot of panel. It will be seen that an output of $Q_1 = 60$ Btu per (hr) (sq ft) is recommended in rooms of 7 ft 6 in. ceiling height, or higher. In the case of floor panels, the heat output and surface temperature are restricted by the type of occupancy. The heat output, Q_1 in a continuously heated room (C) should be smaller than that in an occasionally occupied room (O, column 13).

Sizing the Piping System and Finding Coil Length

Although the size of most panels will be smaller than the area given in columns 10 or 11 of Table 1, the pressure drop in each coil may be fixed at either 3.3 ft or 7.5 ft by means of the coil balancing valve. By deducting the coil pressure drop from the pump head, the pressure drop P_p in feet available for the piping system is obtained. Multiplying by 12, this is converted into inches (*e.g.* 5 ft pump head, 3.3 ft in coil; 1.7 ft in piping, then $P_p = 12 \times 1.7 = 20.4$ in.) The individual coil flow requirements computed according to column 7, Table 1 are noted in the piping diagram and the equivalent length of the longest circuit is found (*e.g.* 200 ft). By dividing the allowable piping

Table 1—Data for Economical Design

1	2	3	4	5	6	7	8	9	10	11	12	13
COIL NO.	PANEL OUTPUT	PANEL LOSS	HEATED OR UNHEATED SPACES (See Foot Note)	NOMINAL TUBE DIAM. (Type L Tubing)	WATER TEMP. DROP IN COIL	FLOW PER SQ FT OF PANEL	MEAN WATER TEMP.	TUBE SPACING	MAXIMUM ALLOWABLE PANEL AREA IN SQ FT WITH COIL PRESSURE DROP OF 3.3 OR 7.5 FT		CEILING HEIGHT	TYPE OF OCCUPANCY
	Btu per (Hr) (Sq Ft)	Btu per (Hr) (Sq Ft)		In.	F deg	Lb/Hr	F	In.	3.3 Ft	7.5 Ft		
	Q_1	$Q_1{}^L$				F_1	t_w	S	P_3max	P_7max		
1-C	50 60 70	20 25 30	H_a	⅜	30	2.34 2.83 3.33	150	7 5½ 4½	95 80 65	130 105 90	7 7.5 8.0	
2-C	50 60 70	11 14 17	H_a	⅜	30	2.03 2.47 2.90	150	7½ 6 5	110 90 75	145 120 100	7.0 7.5 8.0	
3-C	50 60 70	8 10 12	U_a	⅜	30	1.94 2.33 2.73	150	8½ 7 5½	115 95 80	155 130 105	7 7.5 8.0	
1-F	40 50 60	8 10 13	H_b	½	15	3.20 4.00 4.86	115 120 120	12 11 9	150 125 100	200 165 135		C S.C. O
2-F	40 50 60	12 14 17	U_b	½	30	1.74 2.13 2.57	135 150 170	18 18 18	250 215 200	350 285 260		C S.C. O
3-F	40 50 60	10 12 15	U_b	¾	15	3.33 4.14 5.00	110 115 125	12[a] 12 12	260 230 200	360 310 275		C S.C. O

H_a = Heated above H_b = Heated below U_a = Unheated above U_b = Unheated below C = Continuous S.C. = Semi-Continuous O = Occasional

[a] = for 9 in. spacing—See Table 2

pressure drop in inches by the length of this circuit, the drop in inches of water per foot of piping is found and the system may be sized according to Table 3 as follows:

$\frac{20.4}{200} = 0.102$, use column headed by 0.100 in. per ft

To find the coil length for any tube spacing, multiply the panel area by the factor F given in Table 4.

For obvious reasons, the conductivities of building materials vary according to their composition. In order to take into consideration such changes, the data had to be based on conservative assumptions and hence will result in properly designed systems even under less favorable conditions. Under favorable conditions, the water temperatures used will prove to be lower than those recommended by this method.

Summary

All design data pertaining to radiant heating design for systems installed in the more common types of building structures are given in Tables 1 to 4. The data are restricted to rooms of 70 F air temperature, standard panel outputs and most economical coil design. Additional ceiling data are given

Table 2—Design Data for Low Water Temperature

1		3	4	5	6	7	8	9	10	11	12	13
COIL NO.	PANEL OUTPUT	PANEL LOSS	HEATED OR UNHEATED SPACES (See Foot Note)	NOMINAL TUBE DIAM. (Type L Tubing)	WATER TEMP. DROP IN COIL	FLOW PER SQ FT OF PANEL	MEAN WATER TEMP.	TUBE SPACING	MAXIMUM ALLOWABLE PANEL AREA IN SQ FT WITH COIL PRESSURE DROP OF 3.3 OR 7.5 FT		CEILING HEIGHT	TYPE OF OCCUPANCY
	Btu per (Hr) (Sq Ft)	Btu per (Hr) (Sq Ft)		In.	F deg	Lb/Hr	F	In.	3.3 Ft	7.5 Ft	Ft	
	Q_1	$Q_1{}^L$				F_1	t_w	S	P_{3max}	P_{7max}		
1-C	50	20	H_a	⅝	30	2.34	130	5	85	115	7	
	60	25				2.83	135	4½	75	100	7.5	
2-C	50	11	H_a	⅝	30	2.03	130	5	95	125	7	
	60	14				2.47	135	4½	80	105	7.5	
3-C	50	8	U_a	⅝	30	1.94	130	5½	98	130	7	
	60	10				2.33	130	4½	80	110	7.5	
1-F	40	8	H_b	½	15	3.20	105	9	135	180		C.
	50	10				4.00	112	9	115	155		S.C.

H_a = Heated above H_b = Heated below U_a = Unheated above C = Continuous S.C. = Semi-Continuous

Table 3—Flow Capacity and Pressure Drop of Type L Copper Tube

Pressure Drop (In. per Ft)		0.025	0.050	0.075	0.100	0.150	0.200	0.250	0.300	0.400	0.500	0.600	0.800
Diameter, Inches (Nominal), Type L Copper Tube	⅜	70	104	130	155	192	225	255	285	335	375	415	485
	½	131	196	245	288	360	425	485	535	630	715	800	940
	⅝	235	350	435	515	645	760	860	955	1,120	1,270	1,400	1,650
	¾	370	540	650	800	1,000	1,190	1,325	1,490	1,730	1,980	2,180	2,580
	1	770	1,120	1,410	1,660	2,100	2,450	2,780	3,100	3,600	4,100	4,500	5,350
	1¼	1,400	2,050	2,550	3,000	3,750	4,450	5,000	5,600	6,550	7,400	8,100	9,700
	1½	2,180	3,200	4,000	4,750	6,000	7,000	8,000	8,800	10,200	11,800	13,000	15,200
	2	4,650	6,800	8,500	10,000	12,600	14,800	16,800	18,500	21,800	24,700	27,200	32,200
	2½	8,300	12,100	15,200	17,900	22,000	26,500	30,000	33,000	39,000	44,000	48,500	57,000
	3	13,500	19,800	24,800	29,000	36,400	42,800	48,500	53,500	63,000	71,000	79,000	93,000

Note: This Table is based on 120 F water. Satisfactory for 100 to 150 F water, for Radiant Heating design use. Figures in Table are pounds of water per hour. For easy conversion to gallons per minute, divide by 480.

Table 4—Factors for Determining Coil Length

Tube Spacing.....	4½	5	5½	6	7	7½	8½	9	11	12	18
Factor F.....	2.7	2.4	2.2	2	1.75	1.6	1.4	1.35	1.1	1	0.67

for low water temperature. When designing the system, heat losses are computed in the usual manner and the required unit output per square foot of panel is found by dividing the heat loss by the available panel area. For this output and for the structures shown in Fig. 1, the panel heat loss and water flow requirements are found in Tables 1 or 2 together with all data required for the coil design. These tables also indicate the maximum allowable panel area to be used in connection with certain types of pumps.

The piping system is designed in the conventional manner and by reference to Table 3. Coil length is found in Table 4.

Structural and Insulation Requirements for Houses

A uniform basis for measuring the adequacy of building materials and home construction methods is the objective of a new publication issued by the technical office of the Housing and Home Finance Agency entitled *Performance Standards*. The pamphlet proposes performance standards for structural elements of the house such as floors, walls, partitions, ceilings and roofs as well as data on insulation requirements. The requirements of this document apply to dwellings not over two and one-half stories in height containing one or two dwelling units, and not over two stories in height containing more than two dwelling units, and accessory structures, such as garages.

The pamphlet emphasizes the importance of developing performance standards for materials and structural systems rather than stating requirements in terms of types, grades, dimensions, spacings, mixes, or similar qualities which are often specified in building codes. This approach provides considerable more flexibility in the use of new materials and building techniques and is a needed step in the program of modernizing building codes to keep pace with progressive developments in dwelling construction.

The publication is intended primarily for use by building officials, manufacturers, architects, engineers, testing laboratories, and others having a part in production of housing.

Extensive research of engineering data and test reports is reflected in the report, which was prepared in consultation with the constituent units of the Housing and Home Finance Agency, and other Federal agencies, technical and engineering societies, trade associations and professional engineers.

Inasmuch as this is the first attempt to lay out performance standards for housing construction in this manner, comments and suggestions for improving the requirements will be welcomed. It is expected that as the standards are applied under varying conditions, additional knowledge will be forthcoming which will eventually lead to a nationally accepted set of performance standards.

Requirements with regard to insulation are given as follows:

Resistance to Heat Loss

Means to reduce the heat loss of the dwelling, if necessary to attain compliance with the section on *Limitations to Heat Loss*, shall be provided. Such means may include: (*a*) thermal insulation of exposed elements; (*b*) weather stripping permanently installed; (*c*) caulking; (*d*) storm sash, storm doors or double glazing.

Limitations to Heat Loss

1. The heat loss of the dwelling in Btu per hour (exclusive of unfinished enclosed spaces) shall not exceed 60 times the total number of square feet of floor area. For purposes of calculation the floor area shall be measured to the inside faces of enclosing walls.

2. The maximum acceptable coefficients of heat transmission are as follows:

(*a*) Walls, exposed to outdoor temperatures.

$$U=\frac{18}{70-D}$$

(*b*) Floors over unheated space

$$U=\frac{24}{70-D}$$

3. Floor slabs on ground under habitable rooms shall have moisture and verminproof insulation around the perimeter, of maximum acceptable conductance as follows:

(*a*) Ordinary slab floor on ground

$$C=\frac{48}{70-D}$$

(*b*) Slab floors used as radiant heating panels

$$C=\frac{32}{70-D}$$

Calculations of Heat Loss

Calculation of heat losses shall be based on the following: (*a*) data and methods set forth in the current edition of the HEATING, VENTILATING, AIR CONDITIONING GUIDE, published by the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, except as modified by the paragraphs outlined under the sections *Tests* and *Testing Procedures;* (b) inside temperatures 70 F; and (c) outside design temperatures (*D* in the formulas in the section on *Limitations to Heat Loss)* as recommended in THE GUIDE, or as dictated by established local practice.

Tests

Tests shall be made to determine coefficients of heat transmission of materials or elements for which such data are not available.

Testing Procedures

Tests for coefficients of heat transmission shall be made substantially in accordance with the procedures of the *National Bureau of Standards*, Washington, D. C., by either the hot plate method for homogenous materials, or by the guarded hot box method for built-up or laminated sections or elements. Certified reports by nationally recognized testing laboratories shall be acceptable.

Copies of *Performance Standards* may be obtained from the Housing and Home Finance Agency, Washington 25, D. C.

Father Knickerbocker Host to ASHVE for 54th Annual Meeting

Hotel Commodore **New York, N. Y.**

February 2-5, 1948

Extends 102 stories above street, two stories below grade. Its height is 1250 ft to the tip of the mooring mast and 1265 ft to vanishing point. First observation tower on 86th floor and second on 102nd floor

The Empire State Building

WHEN members and guests of the ASHVE from different parts of the country, meet at the Hotel Commodore for the Society's 54th Annual Meeting, February 2-5, 1948, indications are that the business, technical, and entertainment program planned will provide the basis for an informative and stimulating four day *Knickerbocker Holiday*.

The Committee on Arrangements, with Walter E. Heibel as general chairman, is developing a full program which will prove of interest to the members and their families. Tentative plans indicate that there will be special entertainment on Monday evening, Tuesday will be held open, and the annual banquet will be on Wednesday evening. Tickets for a number of the popular broadcasts are being secured by the Entertainment Committee.

Those attending the four day meeting, especially the ladies, will find much to interest them in sightseeing and shopping tours of Father Knickerbocker's city. Not only the regular tours, which include views of the Statue of Liberty, Empire State Building, the *Great White Way*, and the theaters and restaurants, but also the foreign sections where groups of one nationality congregate to form their own city within a city, make New York a mecca for the enterprising visitor.

An official letter of invitation, together with special events' forms, which are to be filled out by those interested, will be mailed to members by the New York Chapter. Those expecting to attend the meeting are urged to make early reservations, on the special forms previously provided, for rooms at the Hotel Commodore, which will be the headquarters for the meeting, and at the Barclay, Biltmore, Roosevelt or Belmont Plaza Hotels, where accommodations are available for ASHVE members and their guests. Although many advance hotel reservations have already been made, the ASHVE housing bureau has ample accommodations available for all members planning to attend.

In addition to the technical sessions, visiting engineers will find many exhibits of interest at the 8th International Heating and Ventilating Exposition which will cover four floors of Grand Central Palace, February 2-6. C. F. Roth, chairman of the Exposition Committee and president of International Exposition Co., has announced that nearly all available exhibition space has been taken, and that many new features of interest to the industry will be shown.

On behalf of the New York chapter, Pres. M. C. Giannini urges members to attend the 54th Annual Meeting, which with their help,

William H. Driscoll
Honorary Chairman

Walter E. Heibel
General Chairman

Homer Addams
Honorary Chairman

Walter L. Fleisher

Dwight D. Kimball
Honorary Chairmen

Alfred J. Offner

promises to be an exceptionally interesting and successful meeting.

Honorary chairmen of the Committee on Arrangements include ASHVE past presidents; Homer Addams, William H. Driscoll, Walter L. Fleisher, Dwight D. Kimball, and Alfred J. Offner. Others who are busy formulating plans to help make the 54th Annual Meeting a success include those serving on the following committees:

Banquet—W. A. Swain, *chairman;* H. H. Bond, J. W. Booker, F. D. Lawrence, R. M. Nee, F. V. Self, B. F. Thomas, Jr.

Entertainment—Harold J. Rose, *chairman;* A. A. Bearman, J. C. Fitts, A. F. Hinrichsen, F. D. McCann, G. E. Olsen.

Publicity—Clifford Strock, *chairman;* W. J. Osborn.

Reception—M. C. Giannini, *chairman;* W. A. Sherbrooke, *vice chairman;* H. H. Bond, A. C. Buensod, V. J. Cucci, H. B. Hedges, C. S. Koehler, L. L. Munier, O. O. Oaks, C. S. Pabst, E. J. Ritchie, H. J. Ryan, Joe Wheeler, Jr.

Exposition—C. F. Roth, *chairman.*

Finance—W. M. Heebner, *chairman;* H. W. Fiedler, *vice chairman.*

Ladies—H. S. Wheller, *chairman;* Mr. and Mrs. G. C. Cummings, Mr. and Mrs. H. B. Eells, Mrs. G. D. Fyfe, Mr. and Mrs. F. D. Lawrence, Mr. and Mrs. T. R. Peyrek, Mr. and Mrs. C. H. Smith, Mr. and Mrs. F. J. Swaney, Mr. and Mrs. A. G. Syska, Mr. and Mrs. W. G. W. Turno, Mrs. H. S. Wheller.

Sessions—H. S. Birkett, *chairman;* L. D. Angell, S. R. Apt, G. C. Cummings, Albert Giannini, C. W. Hartmann, Harry Hartmann, H. J. MacKay, J. D. W. Robertson, J. E. Schechter, J. G. Skidmore.

The Great White Way

Nominees For Members of 1948 Council

Three-Year-Term

DeWitt M. Allen, Kansas City, Mo.—Mr. Allen, a partner in the D. M. Allen Co., representing the Ilg Electric Ventilating Co., and other firms, was born in Leaf River, Ill., on April 13, 1895.

He attended High School in Rockford, Ill., Beloit College and the

DeWitt M. Allen
Kansas City, Mo.

University of Nebraska. His studies at the University were interrupted, however, when he enlisted in the U.S. Navy during the first World War, serving from 1917-1919.

In 1920 he completed a course in heating and ventilating at Armour Institute, Chicago. At the completion of his studies he entered the Chicago office of the B. F. Sturtevant Co. He left Sturtevant in 1921 to accept a position as Toronto branch manager for the Ilg Electric Ventilating Co.

In 1924 he joined the staff of the Chicago Pump Co., as New York branch manager, and after nine years returned to the staff of the Ilg Electric Ventilating Co. as central district manager.

Mr. Allen joined the Society in 1936 and has served the Kansas City Chapter as president, vice president and secretary. As an active Chapter member he served as a member of the Chapter Relations Committee in 1946, as a member of the Chapter Delegates Committee from 1944-1946, and as a member of the Nominating Committee during 1944, 1945 and 1946. He was appointed delegate to the Technical Council of Kansas City in 1945 and 1946.

Mr. Allen also holds membership in the local Engineers' Club, the *Electric Association,* and the American Legion.

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F. Aylmer Hamlet, Montreal, Que., Canada—Mr. Hamlet, branch office manager for C. A. Dunham Co., Ltd., was born in Dublin, Ireland, on November 4, 1893. After five years at Wesley College, Dublin, he worked as a pupil apprentice under the locomotive engineer in the Midland Great Western shops in Dublin. During his apprenticeship he attended the mechanical drawing school in the Royal College of Science.

Upon completion of his course, he came to Canada in 1912 and was

F. Aylmer Hamlet
Montreal, Que.

employed as a draftsman by Canadian Steel Foundries. From 1915 until 1919, he was overseas in the army in World War No. 1. Returning to Canada in 1919, he joined the staff of Darling Bros. Ltd. Montreal. Later, he was employed by the Taylor-Forbes Co., in their Montreal branch office, as an engineering salesman. In 1930 he came to the C. A. Dunham Company's Montreal branch office, becoming the manager in 1933.

During his career, he was responsible for the design and supervision of the heating systems for many prominent buildings throughout the Province of Quebec and in Ontario.

Mr. Hamlet joined the ASHVE in 1936 and has been one of the active members of the Montreal Chapter, serving as its president in 1941, 1942 and 1943 and as a member of its board of governors in 1944 and 1945.

Charles S. Leopold, Philadelphia, Pa.—Mr. Leopold, a consulting engineer and a past president of *ASRE,* was born in Philadelphia on May 8, 1896. He received his preparatory education at Central High School prior to attending the University of Pennsylvania, from which he received his B.S. in electrical engineering in 1917 and subsequently received a degree of E.E. During the first World War he served as an Ensign in the U. S. Naval Reserve.

Mr. Leopold designed and supervised the installation of air conditioning systems for such buildings as: U. S. Capitol, Old House Office Building and the Pentagon Building, Washington, D. C.; the Bankers Life Building, Des Moines; Palmer House, Chicago; Gimbel Bros. stores in New York, Philadelphia and Pittsburgh; the new air conditioning system at Madison Square Garden; and many other important public, commercial, and industrial buildings throughout the country.

He has been an active member of the Society since he joined in 1934, serving as a member of the Society's

Charles S. Leopold
Philadelphia, Pa.

Guide Publication Committee for several years and as its chairman for THE 1946 GUIDE. He has also served on many of the Society's Research Technical Advisory Committees including, the Treatment of Disease, Cooling Load in Summer Air Conditioning, Radiation and Comfort, and Physiological Reactions. Mr. Leopold as a member of the Philadelphia Chapter has served on its Legislative and Meetings Committees.

He has written extensively for *Heating, Piping & Air Conditioning,* and *Refrigerating Engineering,* and has also contributed to the *Journal of the American Medical Association* and other technical publications. In addition he has prepared several papers for presentation at Society meetings, which have been published in both the JOURNAL and TRANSACTIONS.

Mr. Leopold is listed in *Who's Who in Engineering* and is a member of Sigma Xi, and Eta Kappa Nu.

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Howard E. Sproull, Cincinnati, Ohio—Mr. Sproull, division sales manager of American Blower Corp., was born in New Alexandria, Pa., on June 6, 1888. He attended the Bedford, Indiana High School and Bedford Business College, and was a member of the Class of 1912 in mechanical engineering, including heating and ventilating, of Purdue University, West Lafayette, Ind.

In 1907 he was employed in the engineering department of the Virginia and Southwestern Railways on construction work, and two years later he joined the staff of the Corn Products Refining Co., Granite City, Ill., as an automatic machine designer. His first association with the American Blower Corporation was in 1911 and since then he has served as sales engineer and manager of several of their branch offices.

During the first World War he served as a first lieutenant in the Air Corps and took part in the American Relief Administration in Czechoslovakia in 1919.

Mr. Sproull joined the Society in 1920, soon after his discharge, and immediately took an active interest in Society affairs. He has served on many of the Society Committees including the Chapter Relations Committee, the Chapter Delegates Committee, Nominating Committee, and as a member of the current Constitution and By-Laws Committee.

Howard E. Sproull
Cincinnati, Ohio

G. W. Davies, Dunedin, New Zealand, recently elected Life Member of ASHVE

He has also taken an active part in the Cincinnati Chapter, serving as its president, vice president, treasurer, secretary and as a member of its board of governors, as well as serving on all the Chapter Committees.

He also holds membership in the Scabbard and Blade, Iron Key, Cincinnati Country Club, the Phi Delta Theta, and the Masonic organization.

J. K. FAIRBAIRN JOINS FARR CO.

According to a recent announcement, John K. Fairbairn, a member of the ASHVE and of the Illinois Chapter, has been appointed district manager of the Chicago office, the Farr Co., 1335 N. Wells St.

Prior to joining the Farr Co., Mr. Fairbairn was mechanical engineer in charge of heating, ventilating, cooling, utility piping and fire protection with the Kraft Food Co., Chicago. During the war he was engaged in research, design and development work for the Tennessee Eastman Corp., in connection with the atom bomb project at Oak Ridge, Tenn.

Mr. Fairbairn, a native of Ontario, received his technical education at South Dakota State College and the University of Michigan. He is a licensed engineer in the State of Illinois.

IHVE HOLDS 1947 JUBILEE

The 1947 Jubilee Celebrations of the *Institution of Heating and Ventilating Engineers,* London, England, opened on October 7 with a special jubilee meeting which was held in the Lecture Theater of the *Institution of Civil Engineers.* Technical papers were presented during the three-day meeting on the practical relations between heat and electric forms of energy with special reference to district heating, and on air filtration in war as applied to peace conditions.

BATTELLE NAMES ASSISTANT DIRECTORS

R. A. Sherman, formerly supervisor of the fuels division, Battelle Memorial Institute, Columbus, Ohio, and a member of the ASHVE since 1933, was among the six new assistant directors named by the Institute. In his new capacity, Mr. Sherman, with the other assistant directors, will help expedite the increased flow of Battelle research.

Director Clyde Williams announced that these appointments are in keeping with the unique plan of research organization under which the Institute operates. Departmental lines are merely nominal and each research problem that the Institute undertakes is a problem for joint attack by all qualified members of the staff.

Mr. Sherman and the other newly appointed assistant directors, are well known in their particular fields of technology.

R. A. Sherman
Columbus, Ohio

Summary of Local Chapter Meetings*

ATLANTA—September 5, 1947. Subject; Solar Radiation. Speaker: M. J. Wilson, sales engineer, Carrier Corp., Atlanta, Ga. Mr. Wilson illustrated his interesting presentation with slides and a discussion period followed. Other Features: The treasurer gave his report and W. J. McKinney reported for the membership committee. Boynton Cole stated that letters concerning the present GUIDE have been coordinated and would be sent to the Guide Publication Committee. A report on future meetings was given by Warren Carder. Attendance 65. Attendance ratio 0.59.

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CENTRAL NEW YORK—September 17, 1947. Speaker: Dr. C. M. Carpenter, associate professor of bacteriology, University of Rochester, School of Medicine. Subject: The Efficiency and Application of Present Methods of Air Sterilization. Dr. Carpenter explained the four principal methods of approach to the problem of air sterilization, pointing out that there is not complete agreement of the relative efficiency of these methods and that the problems connected with these methods have not yet been solved. Dr. Chapman, Syracuse University, offered some interesting comments on Dr. Carpenter's informative talk. Other Features: Attention was given to the programs for coming meetings and the election of a chapter delegate and alternate to the 54th annual meeting. Attendance 32.

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CENTRAL OHIO — September 15, 1947. Subject: The Heat Pump. Speakers: E. L. Vogt, Ohio Power Co., James Eibling, Battelle Memorial Institute, Robert Morgan, Dayton, Ohio. The subject was well handled by the three speakers who dealt not only with the theory, but also with the actual installation of this type of heating. The development of the heat pump was traced from 1852, when the principles were formulated by Lord Kelvin, up to the present day. Slides were used to illustrate this interesting presentation. A. T. English, Prof. A. I. Brown, and J. D. Slemmons composed the chapter's panel and raised some interesting questions concerning operation and costs. This was the first of a new type of panel program which has been instituted by the chapter's program committee under the chairmanship of T. R. Walker. According to this new plan, several authorities are invited to discuss a subject and to encourage audience participation. Attendance 68. Attendance ratio 0.46.

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GOLDEN GATE—September 25, 1947. Panel Discussion on central unit air conditioning systems. Moderator: James Gayner, consulting engineer, San Francisco, Calif. Buck Henderson compared two large air conditioning systems installed by Douglas Aircraft, and showed the advantages of the decentralized system over the centralized system. T. J. White, spoke in regard to schoolroom installations, in which he said the superiority of the unit ventilator was demonstrated. D. L. Williams spoke on the general advantages of the central system over the unit system and Karl Baldwin, Jr., presented some comparison figures that had been prepared for the air conditioning of a 300 ton apartment house. Mr. Gayner conducted a period of discussion and questions which followed the speakers' comments. Other Features: Pres. F. W. Kolb reported on a professional engineers registration act which had been passed by the legislature. The secretary read the report of the board of governors and the proposed amendments to the chapter by-laws were discussed. An announcement was made regarding the progress of work on the *Golden Gate Fog Dispenser*, the chapter's new publication. Attendance 80.

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NORTHERN OHIO—September 16, 1947. Subject: Annual Fall Golf Meeting, with D. E. Mannen as chairman of the entertainment committee, was held at the Manakiki Golf and Country Club. Pres. John James officially opened the 1947-48 season and introduced past presidents F. A. Kitchen, C. A. McKeeman, L. T. Avery, H. E. Wetzell, and J. E. Wilhelm. The meeting was turned over to the entertainment committee and no further business was transacted. Attendance 60. Attendance ratio 0.37.

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NORTH TEXAS—September 15, 1947. Subject: Personal Experiences as a Member of the Water Cooling Industry. Speaker: L. T. Mart, president and founder, the Marley Co. Inc., Kansas City, Kans. Mr. Mart gave a brief history of his personal experiences and how he became associated with the water cooling industry. He outlined new methods which have been developed by this industry and concluded with a very interesting series of pictures and slides showing various types of applications of induced, forced and atmospheric type towers as used in modern day industries, both in air conditioning and petroleum refining. Other Features: Pres. C. Rollins Gardner welcomed members of the *American Society of Refrigerating Engineers* and introduced L. M. Snell, chairman of the Dallas-Forth Worth section of the *ASRE*.

*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

A brief report was given by J. A. Ray of the membership committee, and Herman Blum, Jr., chairman of the program committee, outlined the programs for the remainder of the year. President Gardner announced the arrangements which had been made for a special car to the 54th Annual Meeting in New York, and stated that he had invited interested members of the South and Southwest Texas Chapters to make the trip on the proposed *Lone Star Special*. Attendance 89. Attendance ratio 0.68.

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ST. LOUIS — September 9, 1947. Subject: Thermal Expansion Valves, Design and Their Application. Speaker: F. M. MacDougall. Slides were used by Mr. MacDougall to illustrate his topic, which dwelt mostly on the relative merits of the expansion valve and float type valve on "Freon" systems. A lively question and answer period followed after which a rising vote of thanks was accorded Mr. MacDougall. Other Features: G. H. Bemarkt introduced the guests and a report on the Spring Party Dance was given by M. F. Carlock. Attendance 45.

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SOUTHERN CALIFORNIA—September 17, 1947. Subject: Water Treatment in the Air Conditioning Field. Speaker: R. M. Westcott, president, Ralph M. Westcott Co. In his interesting talk, Mr. Westcott spoke on the problems encountered in the use of water cooled condensing equipment. He also emphasized the obligation of the air conditioning manufacturer and engineer to design condensing equipment to utilize water to its greatest efficiency. He stressed the obligation of the contractor to appraise the customer of the problems to be faced in the treatment of water cooled equipment to prevent or retard the formation of scale. Other Features: Lloyd Helms gave a report on the financial status of the chapter, and W. N. Pauley gave a financial report on the Semi-Annual Meeting at Coronado. R. A. Lowe was appointed delegate to attend the 54th Annual Meeting in New York, with R. S. Farr serving as alternate. Attendance 68. Attendance ratio 0.17.

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WISCONSIN — September 15, 1947. Subject: Patent Misconceptions. Speaker: Roger Sherman Hoar, head, legal and patent department, Bucyrus-Erie Co., South Milwaukee, Wis. Mr. Hoar stated that most business men do not know enough about patent law and mentioned some of the popular misconceptions concerning this law. He also discussed the operation and advantages of our patent system. This topic was well received and a lively discussion period was held. Other Features: The secretary read the names of those selected by President Vernon to serve on the various chapter committees and Frank Nunlist was appointed chapter delegate to the 1948 annual meeting. It was also announced that M. W. Crew was elected vice president of the *Smoke Prevention Association of America* at its annual convention at Toronto in August. Attendance 46. Attendance ratio 0.53.

NOTED CHEMICAL ENGINEER DIES

Earle W. McMullen, director of research, Eagle-Picher Co., Joplin, Mo., died August 26, 1947, at the Mt. Carmel Hospital, Pittsburgh, Kans., after a nine weeks' illness. He was widely known in the tri-state mining district for his chemical research.

A native of Picton, Ont., Canada, Mr. McMullen was born on July 10, 1887. He attended Picton High school prior to attending the Armour Institute of Technology. Mr. McMullen was graduated with a B.S. in chemical engineering in 1909 and received an advanced degree in chemical engineering in 1913. He was an instructor at Armour Institute from 1909 until 1914, when he left to become technical director for the Simmons Co., Kenosha, Wis. In 1928, he became factory manager for the J. E. Burke Co., Fond du Lac, Wis. A year later he joined the research department of The Celotex Corp., Chicago, Ill., as a chemical engineer, and in 1931 he was appointed technical director and plant manager for the Ault and Wiborg Corp., Cincinnati, Ohio. He began his association with the Eagle-Picher Co., in 1935, when he became head of research for the four divisions of the company, insulation, metals, pigments, and lead-in-oil.

A member of the Society since 1938, Mr. McMullen was a member of the Technical Advisory Committee on Insulation for several years. He also held membership in the *American Chemical Society, American Society for Testing Materials, American Institute of Mining and Metallurgical Engineers, the American Institute of Chemical Engineering* and the Federation of Paint and Varnish Production Clubs.

He is survived by his widow, a son, George McMullen, a daughter, Mrs. Jean Coolidge, and two brothers, Ralph S. McMullen and Herbert H. McMullen, to whom the Officers and Council of the ASHVE extend their deepest sympathy.

W. N. McINTYRE DIES

W. N. McIntyre, Barry, Mo., a former member of the ASHVE, and a past president of the Kansas City Chapter, died at his home on September 2, 1947, following a six weeks illness.

Born on November 14, 1862, in Cedarville, Ohio, Mr. McIntyre spent most of his professional career with the Holtman Heating Co., Kansas City, Mo. During his many years of service with this company he supervised the erecting and designing of heating and ventilating systems for many important buildings in Missouri and Oregon. At the time of his retirement, eight years ago, Mr. McIntyre was serving as manager.

He leaves his widow, Mrs. Bettie McIntyre, a daughter, Mrs. Edna Eldred, and two sons, Claude B. McIntyre and William G. McIntyre, to whom the Officers and Council of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS extend their deepest sympathy.

Candidates for Membership

The Constitution of the Society, as now amended, requires the following mode of procedure in voting on applicants for membership in the Society. All applications for membership are to be sent to the Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society or sent to the members in other approved manner as ordered by the Council. When the replies are received from references, the Candidate's application shall be submitted to and acted upon by the Committee on Admission and Advancement as soon as possible.

When the Committee on Admission and Advancement has acted favorably upon a Candidate's application and assigned his grade, the Council shall vote upon the election of the proposed Candidate for membership by letter ballot. During the past month 37 applications for membership have been received and the names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Committee on Admission and Advancement, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by November 20, 1947, these candidates will be balloted upon by the Council. Those elected to membership will be notified by the Secretary immediately after election.

ALLISON, WILLIAM F., Air Cond. Mgr., E. A. Berman Co. PROPOSERS: M. L. COHEN, T. S. Hart. SECONDERS: Mitchel Landau, B. J. Wahlin.

BICKEL, HENRY A., Sales Engr., Johnson Service Co. PROPOSERS: J. A. Cutler, J. R. Vernon. SECONDERS: H. W. Schreiber, M. M. Herrick.

BRACKETT, WILLIAM H., Treas., Reynolds Corp. PROPOSERS: M. J. Bamond, C. M. Burnam, Jr. SECONDERS: C. E. Price, G. W. Bornquist.

CALDWELL, WILLIAM C., Sales Mgr., Sheldons, Ltd. PROPOSERS: R. H. Everest, W. D. Sheldon, Jr. SECONDERS: Arthur Nearingburg, W. H. Evans.

CHAUVIN, JEAN-PAUL, Mgr., Sorel Mill & Builders Supply Ltd. PROPOSERS: J. B. Way, R. A. Standring. SECONDERS: S. W. Salter, J. J. Cosgrove.

CROWE, ROBERT H., N. O. Nelson Co. PROPOSERS: W. J. Way, J. C. Lewis. SECONDERS: Norman Way, A. M. Chase, Jr.

D'AUTREMONT, HUBERT F., Cons. Engr. PROPOSERS: L. J. Helms, R. A. Lowe. SECONDERS: A. G. Small, J. L. Blake.

DELL, JOHN A., Pres., The Dell Corporation. PROPOSERS: M. J. Bamond, W. A. Kuechenberg. SECONDERS: J. E. Patten, G. W. Bornquist.

ENGLISH, G. A., Mgr., English & Mould, Ltd. PROPOSERS: V. J. Jenkinson, George Hatch. SECONDERS: W. R. Blackhall, W. J. Usher, Jr.

FREAN, FREDERICK C., Tech. Dir., The Air Treatment Engineering Co., Ltd. PROPOSERS: H. W. J. Lipscombe, V. A. Kennett. SECONDERS: H. W. Pasteur, J. K. M. Pryke.

GOLDMAN, REUBEN J., Engr., Reg. F. Taylor. PROPOSERS: B. L. Shannon, E. F. Yates. SECONDERS: C. S. Woodruff, R. J. Salinger.

GRAHAM, ROBERT L., Branch Mgr., American Blower Corp. PROPOSERS: Earl deWitt, H. H. Hill. SECONDERS: Karl Selden, Jr., W. W. Berger.

HORWITZ, SAUL, Plbg. & Htg. Designer, H. Horwitz, Inc. PROPOSERS: H. E. Walter*, G. H. Neugebauer*. SECONDERS: J. L. Polaner*, T. A. Schneider*.

HULTGREN, JOHN T. B., Asst. Sales Engr., McQuay, Inc. PROPOSERS: H. B. Williams, P. G. Kayser. SECONDERS: C. W. Larson, R. K. Mattson.

KAHN, WALTER C. JR., Gen. Supvsr., New York Testing Laboratories, Inc. PROPOSERS: G. B. Jack, Jr.*, G. J. Horwitz*. SECONDERS: Watson Vredenburgh*, E. L. Midgetto*.

KERCHEVAL, WILLIAM L., Student, Purdue University. PROPOSERS: W. T. Miller, C. F. Warner. SECONDERS: H. G. Venemann, A. C. Menke.

KIMMEL, ABEL J., Mech. Engr., Raisler Corp. PROPOSERS: L. K. Berman, R. K. Raisler. SECONDERS: F. F. Taverna, Harold Herkimer.

KNOX, ALVA E., Student, Purdue University. PROPOSERS: W. T. Miller, D. S. Clark*. SECONDERS: Cecil Warner, C. L. Brown.

MACLEAN, ROBERT M., Mech. Engr., Socony Vacuum Co. PROPOSERS: R. S. Mizener, D. R. Holt. SECONDERS: J. E. Love, J. O. Kirkbride.

MARCHAND, EARL, E., Appl. Engr., Coastal Equipment Co. PROPOSERS: Frank Young, C. E. Powitzky. SECONDERS: Frank Skinner, C. C. Quin.

MOLNARI, BOB A., Mgr. & Partner, Eggelhof Engineers. PROPOSERS: E. R. Thomas, D. S. Cooper. SECONDERS: W. C. Laughlin, H. M. Canterbury.

MONTEITH, ERIC M., Designing Engr., Meadows Critoph & Co. PROPOSERS: William Philip, H. B. Jenney. SECONDERS: H. R. Roth, J. W. Powlesland.

MOONEY, WELDON, Partner, Mooney Engineering Co. PROPOSERS: P. C. Leffel, F. G. Ehlers. SECONDERS: L. T. Mart, C. V. Werner.

NINMAN, ALEX T., R. E. Chase & Co. PROPOSERS: Dick Blankenship, W. A. Simpson. SECONDERS: W. R. Norte, P. F. Sandsted.

ORMAZA, MANUEL R., Engr., Cia Electric de Cuba. PROPOSERS: M. F. Amezaga, G. V. Colmenares. SECONDERS: M. A. Cadenas, Jr., H. H. Koster.

REED, A. GEORGE, Plant Engr., The Gurney Foundry Co., Ltd. *(Advancement)* PROPOSERS: A. H. Hills, J. W. Powlesland. SECONDERS: V. J. Jenkinson, Arthur Nearingburg.

ROBINSON, GARFIELD W., Supvsr., Sheet Metal Dept., The Gurney Foundry Co., Ltd. *(Advancement)* PROPOSERS: A. G. Reed, A. H. Hills. SECONDERS: J. W. Powlesland, V. J. Jenkinson.

RUDLOFF, CHARLES S., Sales Engr., A. M. Lockett & Co., Ltd. PROPOSERS: C. C. Quin, A. E. Workman. SECONDERS: L. L. Ladewig, G. A. Bugher.

SCHWERMAN, CARL H., Engr., R. B. Hayward Co. PROPOSERS: W. A. Kuechenberg, J. E. Patten. SECONDERS: M. J. Bamond, G. W. Bornquist.

SMITH, STELLE, JR., Pres., Stellco, Inc. PROPOSERS: N. B. Bueter, Kenyon Gerrish. SECONDERS: H. E. Gerrish, R. L. Honey.

SNOW, RALPH C., Sales Engr., English & Lauer, Inc. PROPOSERS: L. J. Helms, J. L. McCullough. SECONDERS: J. L. Blake, J. D. Owen.

SPRAGUE, KENNETH T., Dist. Repr., Bell & Gossett Co. PROPOSERS: C. F. Woese, H. K. Ormsby, Jr. SECONDERS: P. D. Robson, G. F. Keane.

THOMPSON, FREDERICK W., Sales Engr., Bornquist, Inc. PROPOSERS: C. M. Burnam, Jr., W. A. Kuechenberg. SECONDERS: G. W. Bornquist, M. J. Bamond.

WARNER, CLARENCE A., Service Mgr., General Oil Co., Inc. PROPOSERS: L. A. Brissette, Adolph Ehrenzeller. SECONDERS: N. J. Shaw, D. M. Archer.

WHITE, PHILIP H., Engr., Stone & Webster Engineering Corp. PROPOSERS: E. L. Blair, H. S. Cole. SECONDERS: D. W. Blair, Morris Brown.

WITHERIDGE, JOHN M., Partner, W. A. Witheridge Co. PROPOSERS: T. H. Mabley, R. D. Randall. SECONDERS: P. S. Hosman, R. H. Oberschulte.

WOLFE, CLARENCE E., SR., Reynolds Corp. *(Advancement)* PROPOSERS: A. P. Brown, M. J. Bamond. SECONDERS: C. M. Burnam, Jr., C. E. Price.

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* Non-Member

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

JOURNAL SECTION

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Two Years: E. G. CARRIER, F. W. HUTCHINSON, R. A. SHERMAN, M. S. WUNDERLICH.

One Year: W. A. DANIELSON, E. N. MCDONNELL, ALFRED J. OFFNER, H. R. ROTH, ERNEST SZEKELY, L. P. SAUNDERS, *Ex-Officio*.

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Chapter Delegates Committee

CHAPTER	DELEGATE	ALTERNATE
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Central New York: Organized 1944. Headquarters, Syracuse, N. Y. President, H. G. Strong, 300 S. Geddes St., Syracuse 1. Secretary, G. F. Keane, 316 Haddonfield Dr., DeWitt, N. Y.

Central Ohio: Organized, 1944. Headquarters, Columbus, Ohio. Meets, Third Monday. President, R. B. Breneman, 1282 Edgehill Rd., Columbus 8. Secretary, A. E. Norman, Jr., 1150 Chesapeake Ave., Columbus.

Cincinnati: Organized 1932. Headquarters, Cincinnati, Ohio. Meets, First Tuesday, President, H. K. Jennings, 1639 Union Trust Bldg., Cincinnati 2, Secretary, K. B. Little, 852 Temple Bar Bldg., Cincinnati 2.

Connecticut: Organized, 1940. Headquarters, New Haven, Conn. President, S. R. Osborne, Waterbury 91. Secretary, Winfield Roeder, 405 Temple St., New Haven.

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Delta: Organized, 1939. Headquarters, New Orleans, La. Meets, Second Tuesday. President, J. S. Burke, 317 Baronne St., New Orleans 9. Secretary, R. B. Guest, 827 Dryades St., New Orleans 13.

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Golden Gate: Organized, 1937. Headquarters, San Francisco, Calif. Meets, First Wednesday. President, F. W. Kolb, 598 Monadnock Bldg., San Francisco 5. Secretary, K. F. Baldwin, Jr., 419 Kentucky Ave., Berkeley 7.

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Illinois: Organized, 1906. Headquarters, Chicago, Ill. Meets, Second Monday. President, W. A. Kuechenberg, 1714 Sheffield Ave., Chicago 14. Secretary, G. W. Bornquist, 629 W. Washington Blvd., Chicago 6.

Indiana: Organized, 1943. Headquarters, Indianapolis, Ind. Meets, Fourth Friday. President, I. W. Cotton, 1035 N. Pennsylvania St., Indianapolis 4. Secretary W. R. Fenstermaker, 215 E. New York St., Indianapolis 4.

Iowa: Organized, 1940. Headquarters, Des Moines, Ia. Meets, Second Tuesday. President, C. A. Wheeler, 1217 Grand Ave., Des Moines. Secretary, D. E. Wells, 304 Home Federal Bldg., Des Moines 9.

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Kansas City: Organized, 1917. Headquarters, Kansas City, Mo. Meets, First Monday. President, P. C. Leffel, 3323 Main St., Kansas City 2. Secretary, Henry Nottberg, Jr., 914 Campbell, Kansas City.

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Manitoba: Organized, 1935. Headquarters, Winnipeg, Man., Canada. Meets Third Thursday. President, D. S. Swain, 1186 Downing St., Winnipeg. Secretary, A. W. Moss, 26 Ferndale Ave., Norwood, Manitoba.

Massachusetts: Organized, 1912. Headquarters, Boston, Mass. Meets, Third Tuesday. President, Adolph Ehrenzeller, 329 Washington St., Dorchester 21. Secretary, R. T. Kern, 51 Claflin St., Leominster.

Memphis: Organized, 1944. Headquarters, Memphis, Tenn. Meets, First Monday. President, N. C. Ledbetter, 22 S. Cooper St., Memphis 4. Secretary, A. T. Bevil, 1521 Waverly Ave., Memphis 6.

Michigan: Organized, 1916. Headquarters, Detroit, Mich. Meets, First Monday after 10th of month. President, A. E. Knibb, 1003 Maryland Ave., Detroit 30. Secretary, L. A. Burch, 5853 Hamilton Ave., Detroit 2.

Minnesota: Organized, 1918. Headquarters, Minneapolis, Minn. Meets, First Monday. President, L. C. Gross, 5324 Oaklawn Ave., Minneapolis 10. Secretary, L. J. Krause, 2753 4th Avenue S., Minneapolis 8.

Montreal: Organized, 1936. Headquarters, Montreal, Que., Canada. Meets, Third Monday. President, T. H. Worthington, 405 Beaubien St. W., Montreal, Que. Secretary, S. W. Salter, 910 New Birks Bldg., Montreal.

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Nebraska: Organized, 1940. Headquarters, Omaha, Neb. Meets, Second Tuesday. President, Verne Simmonds, 2416 Vane St., Omaha. Secretary, G. W. Colburn, 106 N. 15th St., Omaha 2.

New York: Organized, 1911. Headquarters, New York, N. Y. Meets, Third Monday. President, M. C. Giannini, New York University, New York 53. Secretary, Carl H. Flink, Room 3000, 51 Madison Ave., New York 10.

North Carolina: Organized, 1939. Headquarters, Durham, N. C. Meets, Quarterly. President, C. Z. Adams, 312 Piedmont Bldg., P. O. Box 1356, Greensboro. Secretary, M. F. DuChateau, 205 S. Lyndon St., Greensboro.

North Texas: Organized, 1938. Headquarters, Dallas, Tex. Meets, Third Monday. President, C. R. Gardner, 1000 St. Louis St., Dallas 1. Secretary, G. A. Linskie, 3124 Milton St., Dallas 5.

Northern Ohio: Organized, 1916. Headquarters, Cleveland, Ohio. Meets, Second Monday. President, John James, 3170 W. 106th St., Cleveland 11. Secretary, W. M. Rowe, 1302 Swetland Bldg. Cleveland 15.

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Oklahoma: Organized, 1935. Headquarters, Oklahoma City, Okla. Meets, Second Monday. President, W. W. Frankfurt, 519 Apco Tower, Oklahoma City. Secretary, J. H. Spaan, Jr., 1303 N. Klein, Oklahoma City 6.

Ontario: Organized, 1922. Headquarters, Toronto, Ont., Canada. Meets, First Monday. President D. A. Stott, 195 Spadina Ave., Toronto. Secretary, H. R. Roth, 57 Bloor St., W., Toronto, Ont.

Oregon: Organized, 1939. Headquarters, Portland, Ore. Meets, Thursday after First Tuesday. President, C. W. Brissenden, Electric Bldg., Portland 5. Secretary, L. G. Williams, Box 304, Gladstone.

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Pacific Northwest: Organized, 1928. Headquarters, Seattle, Wash. Meets, Second Tuesday. President, E. H. Langdon, 72 Vine St., Seattle. Secretary, E. J. Rosen, 10238 18th Ave., S. W., Seattle 66.

Philadelphia: Organized, 1916. Headquarters, Philadelphia, Pa. Meets, Second Thursday. President, E. H. Dafter. 12 S. 12th St., Philadelphia 7. Secretary, E. K. Wagner, 2240 N. Broad St., Philadelphia 32.

Pittsburgh: Organized, 1919. Headquarters, Pittsburgh, Pa. Meets, Second Monday. President, D. W. Loucks, 435 Sixth Ave., Pittsburgh 19. Secretary, E. H. Riesmeyer, Jr., 231-33 Water St., Pittsburgh 22.

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Rocky Mountain: Organized, 1944. Headquarters, Denver, Colo. Meets, First Wednesday. President, J. F. Mohan, 2229 Blake St., Denver 2. Secretary, H. C. Kugeler, 2365 Ash St., Denver 7.

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St. Louis: Organized, 1918. Headquarters, St. Louis, Mo. Meets, First Tuesday. President, J. H. Carter, 710 Key West Ave., Webster Groves 19. Secretary, J. S. Rosebrough, 1014 Arcade Bldg., St. Louis 1.

South Texas: Organized, 1938. Headquarters, Houston, Tex. Meets, Third Friday. President, D. M. Mills, Gray and Crawford, Houston 3. Secretary, L. L. Ladewig, Box 1188, Houston 1.

Southern California: Organized, 1930. Headquarters, Los Angeles, Calif. Meets, Second Wednesday. President, R. A. Lowe, 6381 Hollywood Blvd., Los Angeles 28. Secretary, John L. Blake, 1700 S. Bedford St., Los Angeles 35.

Southwest Texas: Organized, 1948. Headquarters, San Antonio, Tex. President, F. C. Benham, Jr., 702 S. Flores St., San Antonio. Secretary, L. S. Pawkett, 810 Insurance Bldg., San Antonio 5.

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Utah: Organized, 1944. Headquarters, Salt Lake City, Utah. Meets, First Wednesday. President, E. V. Gritton, 2470 S. 15th, Salt Lake City 5. Secretary, C. E. Ferguson, 838 Garfield Ave., Salt Lake City.

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Virginia: Organized, 1946. Headquarters, Norfolk, Va. President, R. C. Thomas, 819 Westover Ave., Norfolk 7. Secretary, J. F. Reynolds, Gatling and Marble Ave., Norfolk 2.

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Washington, D. C.: Organized, 1935. Headquarters, Washington, D. C. Meets, Second Wednesday. President, H. H. Hill, 438 Woodward Bldg., Washington 5. Secretary, J. G. Muirheid, 2013 New Hampshire Ave., N. W., Washington 9.

Western Michigan: Organized, 1931. Headquarters, Grand Rapids, Mich. Meets, Second Monday. President, Frank Harbin, Jr., 280 E. 6th St., Holland. Secretary, W. C. DeRoo, 500 E. 8th St., Holland.

Western New York: Organized, 1919. Headquarters, Buffalo, N. Y. Meets, Second Monday. President, G. E. Adema, 39 W. Balcom St. Buffalo 9. Secretary, J. H. Bryce, 88 E. Girard Blvd., Kenmore.

Wisconsin: Organized, 1922. Headquarters, Milwaukee, Wis. Meets, Third Monday. President, J. R. Vernon, 507 E. Michigan St., Milwaukee 2. Secretary, B. M. Kluge, 1817 S. 66th St., Milwaukee 14.

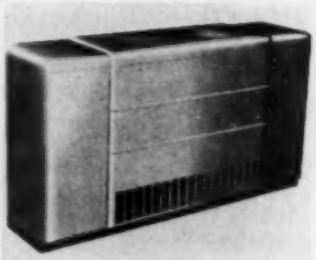
Student Branch

Texas A. & M. College: Organized, 1946. Headquarters, College Station, Tex. Meets, Third Thursday. President, G. H. Jackson, 225 W. Nevada St., El Paso. Secretary, T. V. Burns, P. O. Box 1651, Houston.

EQUIPMENT DEVELOPMENTS

For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1947 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk equipment and manufacturer not listed.

Belt Drive Featured in Unit Ventilator



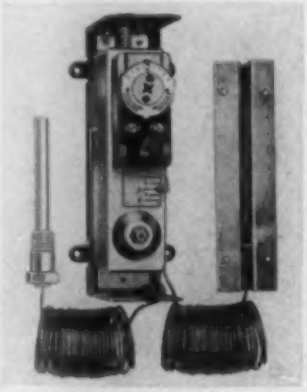
No. 3591—The latest development in the company's unit ventilators for schoolrooms, auditoriums, and industrial installations has been announced by The Trane Co., La Crosse, Wis. A model has been designed and developed for fresh air ventilation and heating.

The company's resilient belt drive mechanism incorporated in this model is said to be "the most important single improvement in unit ventilators in recent years." The new type of drive, says the manufacturer, provides for efficient and quiet operation of the unit, even heat distribution, the use of standard motors, low maintenance expenditures, and the elimination of complicated connections and couplings.

The cabinet has been redesigned to blend with the scheme of any room and to be safe in schoolrooms where small children are apt to be careless.

These unit ventilators use the nonfreeze or steam distributing coil designed to prevent freeze-ups in even the coldest weather when heating outside air for ventilation.

Indoor-Outdoor Control Varies Hot Water Temperatures for Heating



No. 3592—White-Rodgers Electric Co., 1209 Cass Ave., St. Louis 6, Mo., has developed an indoor - outdoor temperature control for use with radiator, convector, and all types of radiant panel hot water heating systems. The unit, shown here with the cover removed, is designed to provide a means for adjusting the maximum water temperature (under design conditions) to the heating requirements and also to provide for reducing the water temperature in accordance with variations in outdoor temperatures.

The control is operated by hydraulic action and has two bulbs; one outside the building and the other located in the hot water system. The two adjustments on the instrument are used to establish the maximum water temperature and, separately, the ratio of water temperature variation to outside air temperature variation. Charts showing the temperature curves for each of the five ratio settings are furnished with each unit.

Two types of control are available; one is for radiant panel systems (walls, floors, ceilings, and baseboards and the other is for conventional radiator-convector systems.

Unit Heaters Designed for Commercial, Industrial Use

No. 3593*—Kennard Corp., 1819 S. Hanley Rd., St. Louis 17, Mo., manufacturer of heat transfer products, has announced a new line of unit heaters for use with steam or hot water. They are designed for commercial and industrial use and are available in a wide range of capacities.

Seamless copper tubing is used for both headers and condensing tubes. They are copper-brazed to each other to form an integral assembly. The fins are of the aluminum plate type, spaced six to the inch by means of deep drawn contact collars. The fins are continuous in width and depth. Coils are guaranteed to withstand pressures up to 150 psi.

Capacities at 2 psi steam and 60 F entering air range from approximately 20,000 to 268,000 Btu per hr. Heaters are offered with single or multi-speed motors for use with single phase, polyphase, or d-c current.

Develops Lower Cost Sheet Aluminum

No. 3594—As a result of intensive development work, Reynolds Metals Co., 2500 S. Third St., Louisville, Ky., has announced a new type of sheet aluminum available at prices which are said to be about 15 percent below

Heating, Piping & Air Conditioning [11-47]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

(Circle each number in which you are interested)

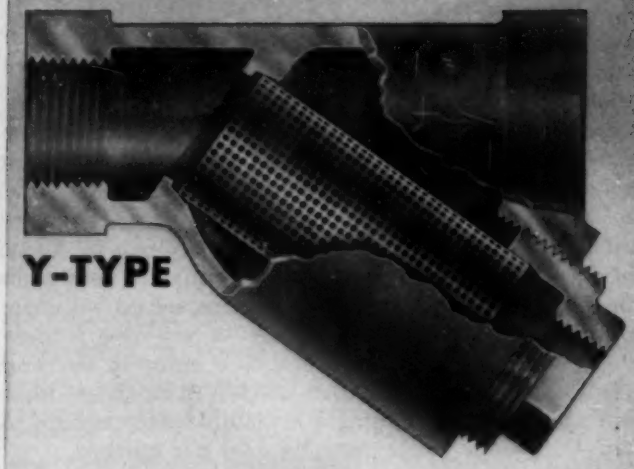
3591 3592 3593 3594 3595 3596 3597 3598 3599 3600
3601 3602 3603 3604 3605 3606 3607 3608 3609 3610
3611 3612 3613 3614 3615 3616 3617 3618 3619 3620
3621 3622 3623 3624
6666 6667 6668 6669 6670 6671 6672 6673 6674 6675
6676 6677 6678 6679 6681 6682 6683 6684 6685
6686 6687 6688 6689 6690 6691

Name..... Title.....

Company .....

Address .....

City..... Zone..... State.....

ADSCO
STRAINERS

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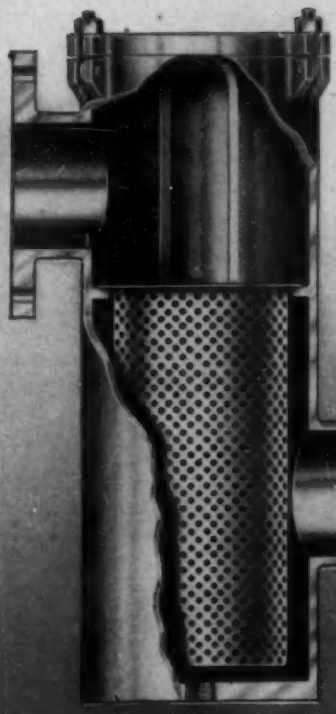
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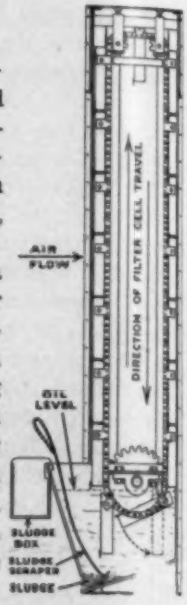
any aluminum previously offered the sheet metal industry.

According to the manufacturer, the new utility sheet will take a Pittsburgh lock seam and is easily bent, formed, welded, rolled, and otherwise fabricated. It is alloyed to provide additional strength and resistance to chemical attack and is said to be especially suitable for use in heating, ventilating, and air conditioning systems, as well as in building products of many types and in the fabrication of many consumer products.

It is available as roller-levelled flat sheets in widths of 30, 32, 36, and 48 in.; lengths of 96, 120, and 144 in.; and as coiled sheets in widths of 24, 30, 32, 36, and 48 in. Both forms can be had in thicknesses of 0.018, 0.020, 0.025, 0.032, 0.040, 0.051, and 0.064 in.

Automatic Air Filter Designed for Many Uses



No 3595—The new "Uniflo" automatic, self-cleaning air filter is offered by Continental Air Filters, Inc., Louisville, Ky., for air conditioning systems handling from 5000 to 200,000 cfm and for use on large diesel engines, gas engines, and air compressors.

Features are said to include (1) a new noncorrosive, all-metal filter media designed for minimum resistance to air flow, maximum freedom from clogging, and excellent cleaning efficiency, (2) a "ferris wheel' action whereby the dirty air side of the filter cells remain on the air intake side on both ascent and descent of the curtain, and (3) an agitating washing action of the cells while submerged in the cleaning tank.

An automatic electrical drive and adjustable timing mechanism are used to make each cell pass through the oil reservoir once during each 24 hr period.

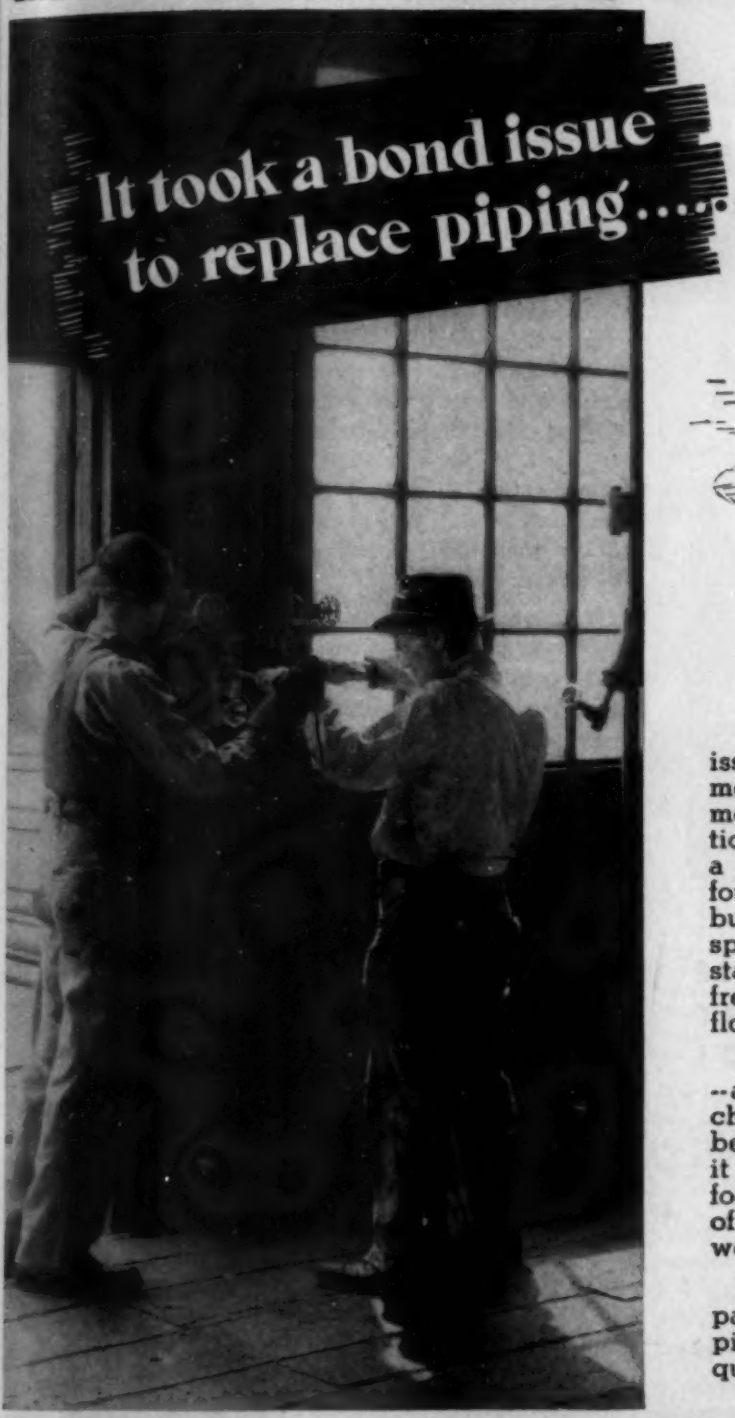
Blowers Designed for Constant Pressure Output

No. 3596—A new line of light weight "Hi-Flo" blowers, designed for constant pressure output over a broad capacity range, has been announced by the industrial division of Bryant Heater Co., 1020 London Rd., Cleveland 10, Ohio.

The new direct-connected centrifugal machines are constructed of aluminum housings, bases and side plates, with a simplified light weight steel impeller. Any one of seven outlet positions may be chosen in a simple changeover scheme requiring only a wrench for adjustment. A flanged outlet connection is used and a three point mounting base simplifies the application. Although normally supplied for clockwise rotation, the entire unit may be reversed without special tools.

A specially designed hub arrangement has been incorporated in the blowers to permit the use of standard 3450 rpm motors with regular shaft extension. Main-

INSTALL STEEL PIPING ADEQUATE FOR TOMORROW'S NEEDS

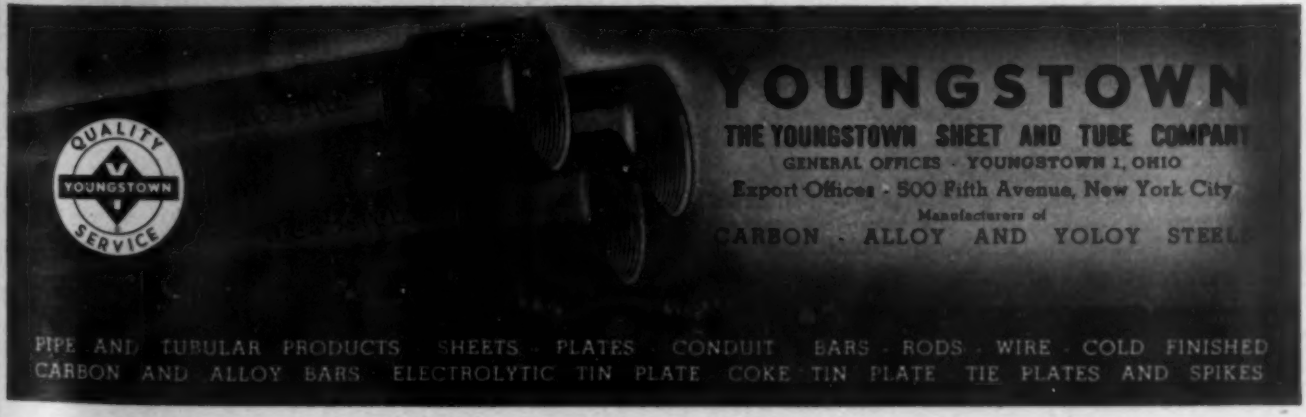


so school children could drink

IN a certain Ohio city, a bond issue was submitted to the voters for modernizing a school building. The most publicized item of the modernization program was a provision to install a complete new system of drinking fountains. In planning and erecting the building several years ago, those responsible had failed to specify and install steel pipe large enough to insure a free flow of water to the fountains on all floors.

How much cheaper for the taxpayers --and how much healthier for the children--if adequately sized pipe had been installed in the first place! Then, it would have cost only a few cents a foot more; now, it's costing thousands of dollars more to get fountains that work satisfactorily.

Youngstown pipe distributors are prepared to recommend and furnish steel pipe of proper sizes for any job, adequate for tomorrow's needs.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CARBON AND ALLOY BARS - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - TIE PLATES AND SPIKES

. . . AT NO MORE THAN THE USUAL COST OF ORDINARY THERMOSTATIC CONTROL

Here, at last, is a *simplified* "outdoor type" temperature control with startling new features. It is ideal for apartments, commercial and industrial buildings, yet so low in cost that even small homes can enjoy the comfort and operating economy possible only with an "outdoor" temperature control.

The Weather-Man is amazingly easy to install. No need to cut through floors, rip out plaster—wiring is all in the basement. Where else can you find a single, simple unit which *automatically* performs all these control functions—

1. **Starts up the heating plant in the morning—earlier on cold days, later on mild days.**
2. **Has the building warm at whatever time is desired.**
3. **Operates the heating plant just often enough during the day to keep building temperature constant.**
4. **Shuts off the heating plant at night—earlier on mild days, later on cold days.**
5. **Stops all heating completely when outdoor temperature rises above 65°.**

DELIVERY NOW!
The Weather-Man is available for immediate delivery through automatic heating equipment wholesalers and distributors.
TERRITORIES OPEN—WRITE!

Send today for descriptive literature.

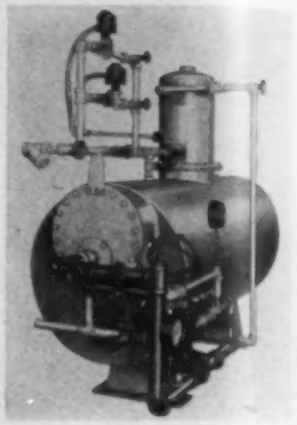
WEATHER-MAN

AUTOMATIC DEVICES CO.
Chicago: 53 W. Jackson Blvd. • New York City: 5 Beekman St.

tenance has also been minimized in the design. No close clearances are involved, and the machines are readily opened for cleaning. Should impellers become damaged, they may be easily replaced.

The blowers initially available in this series range from 2 to 6 in. outlet pipe size, supplying 100 to 525 cfm in the 4 oz pressure classification, and in 2 and 3 in. outlet sizes furnishing 125 cfm at 18 oz, and 275 cfm at 16 oz, respectively. Motors range from ⅛ to 2 hp for these machines, with power requirements in direct proportion to the actual amount of air used.

Deaerates Boiler Feedwater



No. 3597*—Effective mechanical deaeration of all boiler feedwater with oxygen reduction to less than 0.06 cc per liter is claimed by Fred H. Schaub Engineering Co., Inc., 2110 S. Marshall Blvd., Chicago 23, Ill., in their deaerator type feedwater heater.

The process consists of preheating above the boiling point all feedwater which enters the deaerator receiver, and the diffusing of the water under pressure through a series of spray nozzles which spray the water into a very fine film.

There are several variations of the system which can be incorporated into any open type return system. Extensive use of alloys and corrosion-resistant materials is said to reduce maintenance to the minimum. Completely automatic equipment includes gages, thermostats, and regulators, as well as the vent condenser and spray header. It is available in sizes from 100 to 1000 hp rating.

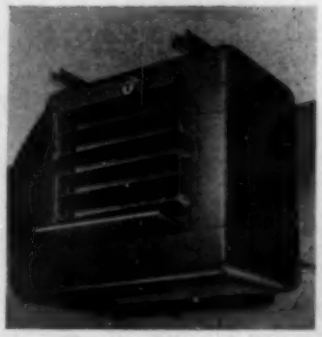
Adhesive Tape Offered for Heating, Air Conditioning Use

No. 3598**—"Fiberglas" industrial adhesive tape No. 263 was developed during the war by Bauer & Black, Div. of Kendall Co., 2500 S. Dearborn St., Chicago 16 Ill., for the Lockheed Aircraft Corp. and for the Navy. It consists of a glass cloth backing, said to have exceptional strength and resistance to deterioration, and a vulcanizable adhesive mass which is claimed to more than double its strength after curing.

The tape is now available to industry and is already used to replace caulking in sealing filter banks, as an air seal in the fabrication of dust collectors, and in the fabrication of flexible duct connections. According to the manufacturer, it is particularly suited for insulating, sealing, and reinforcing many forms of pressurized air ducts, couplings, flues, tubes, cables, etc. It is designed for instant sealing when wound or wrapped tightly in place.

Blower wheels are now available in 5, 6, 7, 8, and 9 in. diameters and in 1 to 6 in. widths. Sizes up to 15 in. wid

Separate Drip Pans Not Used on Unit Cooler



No. 3599*—A new unit cooler designed for comfort cooling of spaces up to 15,000 cu ft volume or for commercial refrigeration has been announced by Tenney Engineering, Inc., 26 Avenue B, Newark 5, N. J.

According to the manufacturer, several of these units, operating from a common condensing unit, permit cooling a relatively large area without the necessity of installing air ducts. Insulation is said to prevent condensation on the outside of the casing so that drip pans are not necessary.

Gas Unit Heater Has Finned, Cast Iron Heat Exchanger

No. 3600—A new gas-fired unit heater has been developed by the United States Air Conditioning Corp., Como Ave., S.E., at 33rd St., Minneapolis 14, Minn., and is currently being produced by the Great National Air Conditioning Corp., 2125 N. Harwood St., Dallas 1, Tex., holder of the exclusive manufacturing license for the new heater.

Designed for commercial and industrial application in new or old structures, the heater is designated as the Model CS-95.

Some of the outstanding features include cast iron ribbon type burners, said to offer quiet operation without flashbacks; cast iron heat exchangers with internal as well as external fins, carrying a five year guarantee against burning out; kidney-shaped 16 in. diameter aluminum fan blades; a streamlined, built-in draft hood; automatic controls; accessibility to every part of the heater; and low installation and operating costs.

The unit has been tested and approved by the American Gas Association.

Blower Wheels Have Annular Lock Blades

No. 3601**—A line of blower wheels has been developed for use in oil burners, stokers, air conditioners, and many other blower applications by the Revcor Co., 3227 W. Carroll Ave., Chicago 24, Ill.

They are available in steel, brass, or aluminum, and increased output for the space dimensions and the horsepower required is claimed because of the design which incorporates a large number of thin gage, full width blades. The blade tips are expanded and locked in the slots of the inlet ring and back plate by a specially developed machine. Rivets are not used for holding the blades.

All over America, leading insulation contractors install NOVOID

n Minneapolis, the Insulation Sales Company, Inc., are leading contractors and engineers for low-temperature work. Above, Insulation's workmen are installing Novoid Corkboard in a fish freezer. At right is the front of their office.

TODAY you can get the best low-temperature insulation materials. America's foremost independent insulation contractors now can furnish Novoid Corkboard, Mineral Wood Board, and Cork Pipe Covering. These materials can be delivered and installed without delay.

Since the insulation is a relatively small part of the cost of building and operating low-temperature facilities, it is sound business to insist on Novoid. For Novoid Insulation has proved its high efficiency and dependability over the years.

For complete facts about Novoid Corkboard, Mineral Wood Board, and sundries specially developed to make them most efficient, write to Cork Import Corporation, 39 Park Place, Englewood, N. J.

NOVOID INSULATION

CORKBOARD · PIPE COVERING

Hydraulic Pressure of Mercury Actuates Compressor Clutch

THE QUICK READY-TO-THREAD *Poster*

RIDGID No. 1R
gives you a time-saving bushingless workholder

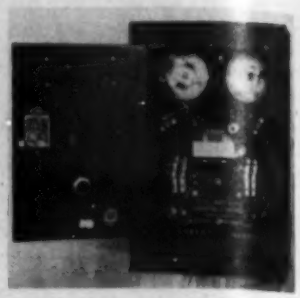
● Here's a poster die stock that's widely popular because it offers new speed in getting ready to thread 1" to 2" pipe. Mistake-proof plate type workholder sets to pipe size in a jiffy. You tighten one screw on pipe—no bushings to fuss with. Threading action is direct, positive, handle to head to dies—wobble-free, easy. Separate sets of 4 precision tool-steel dies for 1," 1¼," 1½" and 2" pipe. You buy it at a popular price—ask your Supply House.

No. 1R stands up—an extra convenience.

RIDGID
WORK-SAVER PIPE TOOLS
THE RIDGE TOOL COMPANY • ELYRIA, OHIO

Blower wheels are now available in 5, 6, 7, 8, and 9 in. diameters and in 1 to 6 in. widths. Sizes up to 15 in. will be available in the future.

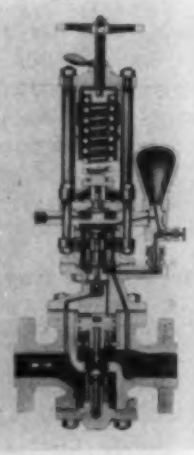
Outside Thermostats Control Building Temperatures



No. 3602** — The Fuel Watchman Co., 77-29 138th St., Flushing, Long Island, N. Y., has announced a heating system control for use with steam or hot water systems using oil, gas, or stoker-firing. Said to serve equally well on central or zone control systems, the unit consists of a roof thermostat, a north side control unit consisting of six thermostats, and a main control unit located in the boiler room. Room thermostats are not used.

The heart of the controller consists of two synchronous motor-driven clocks on which are mounted six schedule discs. Each disc is notched to correspond to one outside thermostat setting so that when the outside temperature is 60 F or below, only one schedule will be in operation. The outside controls are so adjusted that each operates over a different temperature range. In this way the on-off cycling of the firing device or circulating pump is not only based on a time cycle (depending on the disc notching) but is varied with different outside temperature ranges. The roof control is used to determine the effect of solar radiation on the building and to prevent overheating on mild days.

Improves Pump Governors to Resist Wear and Erosion



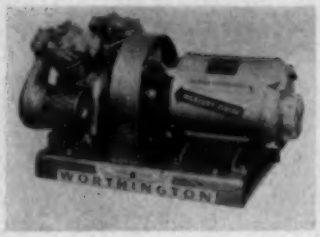
No. 3603 — To improve pump performance and reduce governor maintenance through elimination of stuffing box and rubber diaphragms, Leslie Co., 51 Delafield Ave., Lyndhurst, N. J., has developed a line of pump governors, specially designed for high accuracy of control and to resist wear and erosion.

Hard surfaced seat rings, 800 Brinell hardened stainless steel main valves, and 500 Brinell cylinder liners are used to reduce wear where it is usually felt the most. The hard seating surface is applied as a welded section to seat rings of bronze governors and to the main body of steel governors.

Other design features are said to include accuracy of regulation, a wide spring range which permits settings without change of spring or diaphragm, the use of a single seated valve, no packing or stuffing boxes, and complete interchangeability of replacement parts without removal of the body from the line.

Units are available in sizes from ½ to 4 in. for inlet pressures from 40 to 600 psi at temperatures to 750 F.

Hydraulic Pressure of Mercury Actuates Compressor Clutch



No. 3604—A mercury-actuated clutch developed by Mercury Clutch Corp., Canton, Ohio, has been developed for automatic starting of air compressors by permitting the driving motor to attain full speed before the compressor turns, thus eliminating the need for unloading valves.

The unit incorporates a "time delay" factor which retards the engagement for a second or more, long enough to permit the motor to come up to full speed before any load is applied. Motor current is said to be greatly reduced and the starting windings are protected. Mercury (quicksilver) is used as the control medium because of its high specific gravity. Centrifugal force acting on a small amount of mercury produces hydraulic pressure which is applied directly to the friction shoes of the clutch. These engage the inner surface of the flywheel.

The manufacturer has developed standard clutches for all types of electric motors up to 15 hp and for internal combustion engines. Shown here is a clutch installed between a standard electric motor and a Worthington "Air King" compressor.

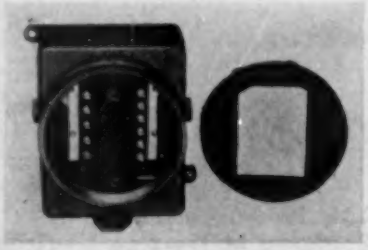
Aluminum Tube Collects Fly Ash

No. 3605—A departure from tubular type dust collectors has recently been announced by the Aerotec Corp. through its sales and project engineers, the Thermix Corp., First National Bank Bldg., Greenwich, Conn.

This tube is a permanent mold aluminum casting and was developed in cooperation with the Aluminum Co. of America. Its diameter is 3 in. This is said to provide high efficiency because of increased centrifugal forces. Small diameter and flush inlets are designed to permit closer spacing of the tubes and reduce eddy currents. The manufacturer claims that these features combine to make the unit one of the most efficient, compact, light weight collectors available today.

A similar tube is used as the fly ash eliminator between combustor and turbine of gas turbines for locomotives.

Probe Circuit Used in Liquid Level Control



No. 3606—Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass., has announced the availability of a new level control, Type 10CB1X. It has been designed for general application with particular consideration to the problems of the chemical processing field.

It is an alternating current control that combines a probe circuit and transformer to operate a direct current relay. Two probe rods wired to the control project into the tank to the levels corresponding to the low point where pumping is to start, and the high point at which

PRECISION PIPE THREADS *Pronto!*

RIDGID

No. 65R is ready to thread 1" to 2" pipe in 10 seconds

65R stands up handily on the floor.

● Here's the rugged self-contained pipe threader that's a pleasure to work with. No extra dies to carry around or lose. One set does the trick for 1," 1¼," 1½" and 2" pipe—sets to size in 10 seconds! Workholder sets instantly—only one screw to tighten, no bushings. Hardened precision-cut chaser dies insure fast perfect threads on iron, steel, brass or copper pipe, or conduit. Every 65R factory tested. Ask your Supply House.

RIDGID

WORK-SAVER PIPE TOOLS

THE RIDGE TOOL COMPANY · ELYRIA, OHIO

6 MILLION GALLONS DAILY
for Janesville, Wis.

Janesville is a mighty lucky city. Their newly installed Layne Water Supply Unit is producing over 6,000,000 gallons daily with enough water on reserve for 16,000,000 gallons daily from the same well. The draw-down beyond the six-million gallons daily is almost negligible. Such a record is greatly attributed to the soundness of Layne's fine engineering and splendid installation methods.

Every Layne Well Water Supply Unit is designed and built to produce the absolute maximum amount of water at a minimum of cost. Many installations exceed the Layne guarantee, thus richly rewarding the buyer for his confidence in the Layne Organization and their proven methods.

If your city, factory, processing plant, railroad or irrigation project needs more water, Layne Engineers will gladly provide dependable water development recommendations. No obligation. For literature, address

LAYNE & BOWLER, INC.
General Offices: Memphis 8, Tennessee

- **pumps** for wells, lakes, rivers, reservoirs, irrigation —or for any use where large quantities of water must be producer at low cost. Sizes range from 40 to 16,000 gallons per minute. Write for Layne Pump Catalog.

LAYNE WELL WATER SYSTEMS
vertical turbine pumps

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La. * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City * Layne-Northwest Co., Milwaukee, Wis. * Layne-Ohio Co., Columbus, Ohio * Layne-Pacific, Inc., Seattle, Washington * Layne-Texas Co., Houston, Texas * Layne-Western Co., Kansas City, Mo. * Layne-Western Co. of Minnesota, Minneapolis, Minnesota * International Water Supply Ltd., London, Ontario, Canada * Layne-Hispano Americana, S. A., Mexico, D. F.

pumping stops. When the level of liquid falls below the lower probe, the level control closes the electrical circuit controlling the pump or valve. When the liquid rises to the level of the upper probe, the fluid acts as conductor of the minute current at low voltage required for the operation of the relay. Opening of the electrical circuit results, and pumping operations stop.

The unit is designed for installation not only under normal industrial conditions but also under some of the most exacting conditions encountered in the chemical processing field. It is supplied as shown here in an explosion proof housing, or more generally, in a pressed steel, dust tight enclosure.

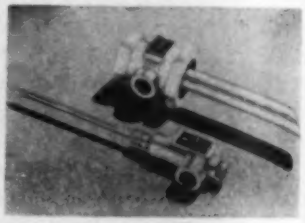
Electrical supply is 115 or 230 volts, 25/60 cycles a-c. Output is 2 amp at 115 volts; 1 amp at 220 volts. A selection of four terminals on the terminal panel enables the probe circuit to be matched to the electrical conductivity of the liquid to be controlled.

Y Type Strainer Now Available

No. 3607—A new Y type strainer, in pipe sizes from ⅛ through 2 in., is now available from A. W. Cash Valve Mfg. Corp., Wabash and Morgan Sts., Decatur, Ill.

The strainers are made in either cadmium-plated cast iron or all-bronze construction and are built around 250 psi standards for cast iron. When furnished with the bronze body, they are suitable for 400 psi service.

Eliminates Air in Hot Water Radiators



No. 3608—Consisting of two basic parts, a boiler fitting and a tank fitting, the "Airtrol" system for eliminating the accumulation of air in hot water radiators has been developed by Bell & Gossett Co., Morton Grove, Ill.

The boiler fitting consists of a tube inserted in a tee shaped fitting, so that in effect, the supply main is extended down into the boiler. This is said to prevent air at the top of the boiler from rising into the piping and heating units. The air flows around the tube up into the pipe leading to the tank fitting which provides separate passages for the flow of air to the top of the compression tank and for the water it displaces to flow back into the system.

Low Hydrogen Content Featured in Welding Electrode

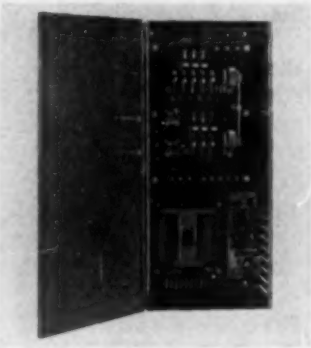
No. 3609—The improved No. 512 all position, mild steel electrode is designed to produce weld metal possessing excellent mechanical properties and low hydrogen content. The manufacturer is Wilson Welders and Metals Co., Inc., 60 East 42nd St., New York 17, N. Y.

This electrode is said to have two advantages over its predecessor in that it can now be used on a-c and d-c

reverse polarity current with the operating characteristics being equal, and preheating of this electrode is no longer required to obtain porosity-free weld deposits that are obtainable by using either the stringer bead or the full weave technique.

Recommended applications include welding high sulphur, free machining steels; welding hardenable steels where no preheat is used; welding cold rolled steels which normally exhibit excessive porosity when welded with conventional electrodes; and weldments to be vitreous enameled after welding.

Develops Starter for Squirrel Cage Induction Motors

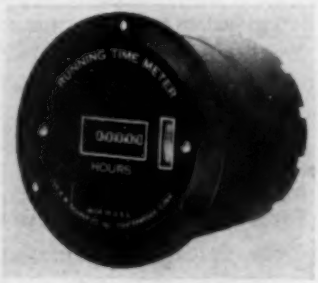


No. 3610—The Ward Leonard Electric Co., Mount Vernon, N. Y., has announced the development of its new Bulletin 4051 a-c automatic motor starters of the nonreversing autotransformer type and designed for use with single speed, two or three phase squirrel cage induction motors driving pumps, fans, motor generator sets, compressors, and other equipment. They are recommended where inrush starting currents must be reduced or where motor starting torque requires adjustment.

The dripproof enclosed starter is arranged in three removable sections, the contactor panel, the timer panel, and the multi-tap autotransformer, providing accessibility to individual components. For ease and simplification of installation all line, load, and control terminals are completely accessible. Adjustable time limit acceleration, overload protection, mechanical and interlock protection, and adjustable taps on the autotransformer are provided on all starters.

Suitable for two wire (low voltage release) or three wire (low voltage protection) control, starters are available in standard sizes for use with squirrel cage induction motors up to and including 100 hp, 550 volts, 60 cycles.

Indicates Operating or Idle Time



No. 3611—Manufactured by R. W. Cramer Co., Inc., Centerbrook, Conn., the new time totalizer or running time meter features a counter that can be reset to zero. Designed for use on a-c circuits, meters automatically register total operating or idle time of any circuit, machine, or system to which connected.

Typical applications are said to include indicating operating time of vacuum tubes so that replacement can be made before failure occurs and indicating total operation hours of automatic pumps and machines, thus forecasting the need of servicing and parts replacement. It is also used to check operating hours of equipment or material to be tested in laboratories, etc.

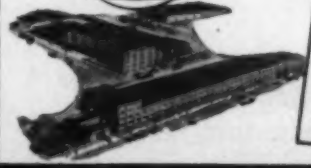
1 BROADLY SPACED BEARINGS, with large capacity lubrication, provide solid footing for thousands of hours of steady service.

2 FLUSH-WELD PRECISION SKEWED ROTOR has no open slots to collect chips, dirt and dust.

3 AIR-STREAM ENCLOSED COOLING makes possible much smaller over-all dimensions than would be required with a "flat" surface shaded pole motor.

If you need twenty-fifth horsepower 4-pole shaded pole motors for A.C. operation, check these fine Type "T" Micromotors. Other Redmond Micromotors are made in sizes from 1/150th up to 1/15th horsepower.

Expanded facilities. Prompt deliveries. Service before and after the sale.



REDMOND

Redmond COMPANY, INC.

MAIN OFFICES:
Owosso, Michigan
EASTERN AREA SALES: 420 Lexington Ave., New York 17, N.Y.
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Redmond facilities now total more than 5 acres floor area and 3000 employees

CLOSE SELECTIVITY THROUGH APPROXIMATELY 100 SIZES

Units range from 18.4 to 1421 square feet of cooling surface . . . and capacities range from 2 to 150 tons.

With 100 different sizes within the above limits, the buyer of a Patterson-Kelley Cooler for Freon, or Methyl Chloride, can so closely match his requirements including a suitable safety factor that he need not buy excess, unusable capacity.

Such broad service to the air conditioning and refrigeration industries implies specialization. And that is just what Patterson-Kelley Engineers have been doing for many years . . . specializing in Coolers, Condensers, Liquid Line Heat Exchangers and other heat-transfer equipment needed in your industry.

THE PATTERSON-KELLEY Company, Inc.
107 WARREN STREET, EAST STROUDSBURG, PA.
BOSTON 16, 96-A Huntington Avenue • NEW YORK 17, 101 Park Avenue
PHILADELPHIA 3, 1700 Walnut Street • CHICAGO 4, Railway Exchange Building

A five digit revolution type counter made of especially developed metals indicates in tenths up to 10,000 hr, then repeats. The synchronous motor used in these meters, of the slow speed, self-starting type, is designed to start and operate satisfactorily on rated voltage plus 10 percent. Meters can be furnished for 60 or 50 cycle frequency, 110 or 220 volts.

Combined Shutoff, Check Valve Used at Welding Stations

No. 3612—Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y., has announced the availability of its new ½ in. welding station outlet valve, a compact, combined shutoff and check valve for use on drops or risers of a piping system.

The unit is a diaphragm type designed to eliminate the necessity of installing a separate shutoff valve and check valve. As a shutoff valve it permits repairs or alterations to be made on equipment downstream from the valve without disturbing other stations on the line; as a check valve, it allows the flow of gas in only one direction and it will close tightly should a disturbance at the welding torch cause a back-pressure to travel as far as the valve.

Pressure Control Used With Diaphragm Regulating Valves

No. 3613—An "all-purpose" pressure control pilot for use with diaphragm regulating valves has been announced by Leslie Co., 51 Delafield Ave., Lyndhurst, N. J.

The unit is a mechanical device used to control the action of a diaphragm regulating valve so as to maintain a constant controlled pressure, and it regulates operating pressure (air, clean gas, water, or light oil) to a standard diaphragm regulating valve in the flow line of the fluid to be controlled.

Economical operation is said to be assured because there is no continuous leakage of operating pressure, "particularly important for standby applications."

The pilot, says the manufacturer, requires no attention over long operating periods and no recalibration during service.

It is made in nine controlled pressure ranges from ½ to 800 psi.

Many Commercial Uses for New Motorized Valves

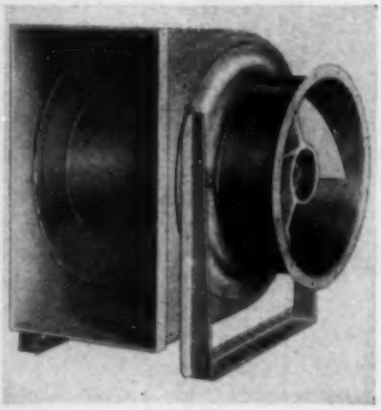
No. 3614—A new motorized valve is being produced by Automatic Temperature Control Co., Philadelphia 44, Pa., for serving the commercial market as an adjunct to the company's line of industrial motorized operators for valves, burners, and dampers.

The new unit is said to be especially adaptable for commercial machinery and equipment such as in heating and air conditioning systems. It provides automatic, two position (on-off) operation of valves for steam, air, gas, oil, or water. An induction type motor is used in

conjunction with a worm and spur gear reduction. Limit switches are adjustable. It requires a three wire thermostat, pressure switch, or other similar instrument for actuation, and operates from either a 24, 110, or 220 volt, a-c power source.

Valves supplied include globe type, all bronze, either single or double seated in sizes ½ to 2½ in. with screwed connections; and butterfly valves, iron body, bronze trim in sizes 1 to 4 in. with either screwed or flanged ends.

Develops Line of Straight Through, Convertible Elbow Axial Fans



No. 3615—A new line of "Axiflo" pressure fans has been announced by the B. F. Sturtevant Co., Div., Westinghouse Electric Corp., Hyde Park, Boston, Mass.

Two basic types of these fans are available; the straight-through type or the convertible elbow type, both furnished with either the three bladed aluminum alloy wheel or the eight bladed steel wheel. Applications for these fans include air conditioning, dust and fume removal, machinery cooling, mechanical draft for combustion, industrial drying and processing.

Designed for either vertical or horizontal operation, they are said to have high mechanical and static efficiency combined with large volumetric capacity to perform effectively against resistance of wind and duct systems. These new fans are designed to provide special features such as less space and weight, high efficiency, straight air flow, and simplified mounting. The convertible elbow type with motor, belt, and bearings located outside the air stream is accessible for inspection and maintenance and is recommended for high temperature service.

Sizes vary from 18 to 72 in., static pressures from 0 to 4 in., and displacement from 2000 to 115,000 cfm.

Railroad Air Filter Built to Withstand Vibration

No. 3616—An air filter, specially designed to withstand heavy vibration, has been developed by Owens-Corning Fiberglas Corp., Toledo 1, Ohio, for use in filtering dust from the air circulated by the air conditioning systems of railroad passenger cars and other railroad rolling stock.

The filter consists of a pack of glass fibers enclosed in a chipboard container faced on the inlet and outlet sides with a metal grille. Available in standard and special sizes, and in thicknesses of 1, 2, 3, and 4 in., it is of the replacement type.

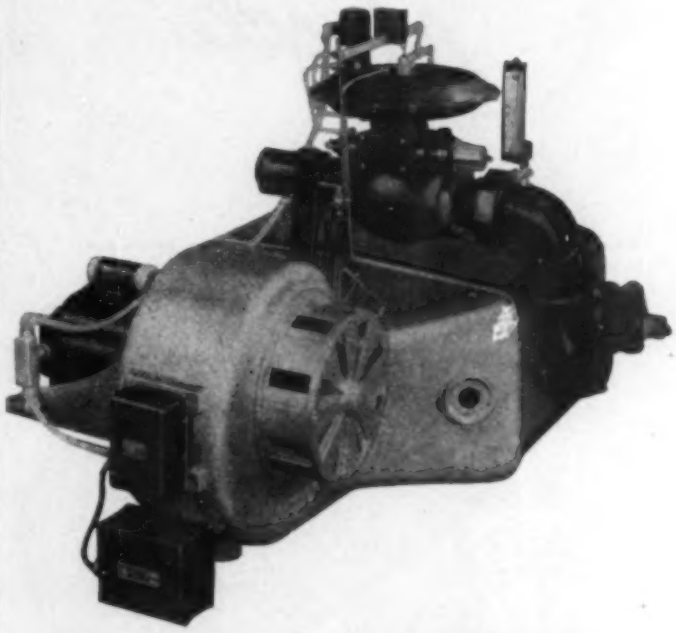
Long service life under heavy concentrations of dust is said to be provided by using a graduated glass fiber pack consisting of relatively coarse fibers on the air intake side and fine glass fibers on the air outlet side. A dust catching adhesive is applied only on the fine fibers.

ENTRAINED COMBUSTION

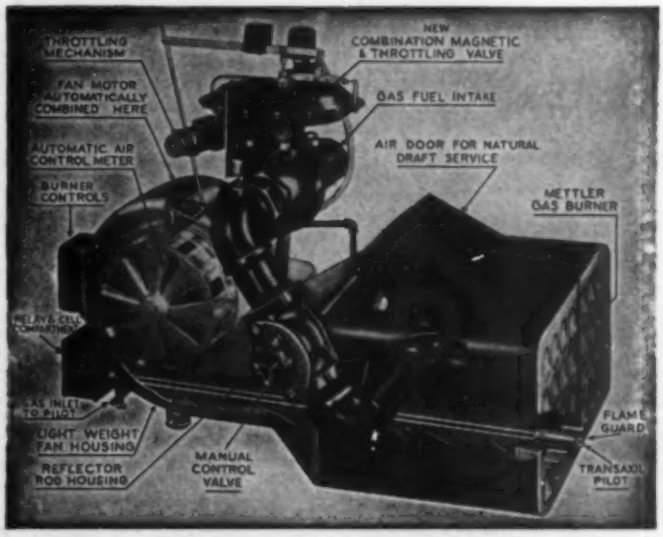
EXPERTO CREDE

The Mettler "FAN-AIR" Gas Burner

LATEST MODEL FEATURES NEW AUTOMATIC SAFETY PILOT and TRIPLE CONTROLS



HERE IS A "FRONT VIEW" OF FAN-AIR GAS BURNERS (COMPACT AND SIMPLE)

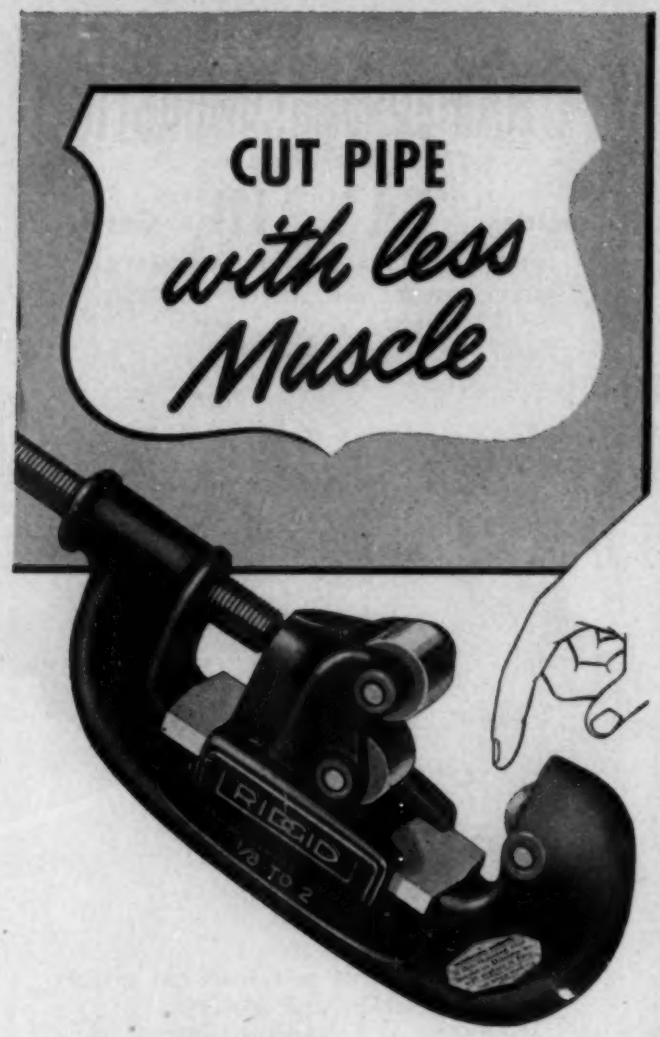


Lower picture reveals essential and highly desirable POINTS of FAN-AIR MECHANICAL DRAFT GAS BURNERS. Not just a gas burner but a COMPLETE AND FULLY AUTOMATIC BURNER SYSTEM, factory tested and ready for application when received. It comes to you complete as pictured with simple, dependable, automatic controls. No other burner so easy to install. Why be satisfied with less—when all these tangible advantages are so readily available. SIZES 5 TO 400 HP.

LEE B. METTLER CO.

406 South Main Street

LOS ANGELES 13 CALIFORNIA



...This efficiency-balanced RIDGID takes the effort out of pipe-cutting

● Slap this sturdy RIDGID Cutter on a pipe and roll it right through in a few easy turns—surprisingly little muscular effort required. You see why the minute you get the efficient feel of its balanced malleable frame—and see the true easy action of its special tool-steel cutting wheel. Every cutter factory tested to insure perfect circle pipe cutting. Your choice of five sizes to 6" capacity; 4-wheel cutters to 4." Buy it at your Supply House.

4-wheel RIDGID *No. 42 for fast quarter-turn cutting in tight places.*

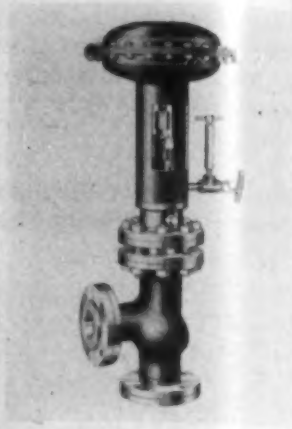
RIDGID

WORK-SAVER PIPE TOOLS

THE RIDGE TOOL COMPANY · ELYRIA, OHIO

This new "Dust-Stop" filter is sold direct to railroads by the manufacturer and is available for immediate delivery.

Control Valve Has Venturi Design



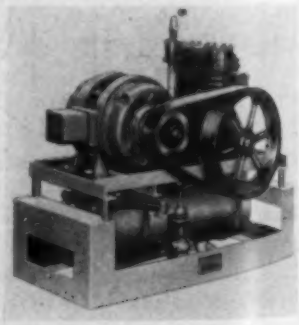
No. 3617—The Hammel-Dahl Co., 243 Richmond St., Providence 3, R. I., has announced a completely new line of "Venturiflo" diaphragm control valves. The primary design incorporates a venturi throat for streamline flow characteristics. These valves are designed primarily for high pressure applications such as in gas and oil well separators, gas transmission, steam reduction, high pressure and high temperature petroleum cracking still operation under severe coking conditions, and high temperature synthesis of gaseous compounds.

The valve body itself conforms to ASA face to center-line dimensions. The friction factor is said to average five in comparison to a friction factor of nine in usual globe or double-seated control valves. The valve plug in all instances is top guided and centered in the seat both by the mechanical guiding and the flow of fluid through the valve body. Actual capacities with full throat area, says the manufacturer, will be one and one half times that of a corresponding conventional control valve. The seat is of the retained type and is lapped into the valve body, which eliminates the use of gaskets.

In all instances these valves are operated by means of an oversize all-steel superstructure. "Oilite" bearings are provided to permit operation of the stainless steel spring stem. If required, the valve can be equipped with the company's continuously-connected handwheel.

Valves are available in sizes from ½ in. through 1 in with screwed ends, and 1 in. through 8 in. in flanged ends. They can be provided for 150, 300, 600, 900 and 1500 psi ASA standard working pressure ratings. Valve bodies are available in cast iron, bronze, cast steel, and types 304 and 316 stainless steel as standard. Valves of this sort are presently being supplied on special applications for pressures as high as 30,000 psi and working temperatures between minus 225 F and plus 1000 F.

Spring Base Used on Compressor-Condenser Unit

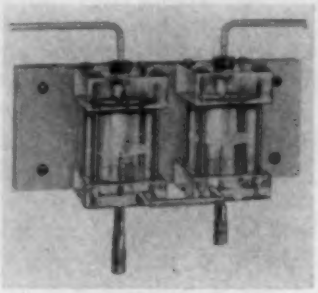


No. 3618*—The addition of a "floating power" high side unit to its line of "Typhoon" air conditioning and low side units has been announced by the Ice Air Conditioning Co., Inc., 794-6 Union St., Brooklyn 15, N. Y.

The new unit features a floating power spring base, designed to absorb vibration and eliminate the need for cork pads and rubber blocks. Delivered complete with

compressor, flywheel, v belt drive, line valves, all-copper condenser, receiver, ball bearing motor, dual pressure control, water regulator valve, and belt guard, this high side unit is available in sizes from 3 to 15 tons.

Hook Gage Designed for Great Accuracy



No. 3619—A new "Transparent Hook Gage" is now being offered to industry by F. W. Dwyer Mfg. Co., 317 S. Western Ave., Chicago, Ill. This instrument, said to exceed in accuracy any in its class yet invented, works on the simple principles of the U type water column gage.

The difficulty encountered in ordinary gages of this type, that of capillary pull on the water columns, is said to be overcome by widening the columns to 2½ in., thus rendering the pull ineffective, especially since the measurements are taken from the center of the column. This is done by needle pointed "hooks" which are attached to depth micrometers of a standard make, reading accurately down to one half of one thousandth of an inch, over a range of 0 to 2 in.

With the exception of the hooks and micrometers, the entire gage is made of an unbreakable, transparent plastic.

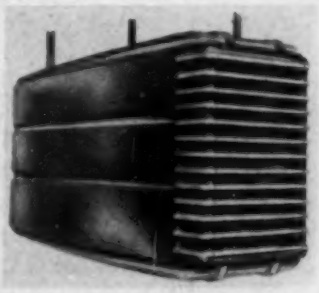
Develops Automatic Controls for Hospitals

No. 3620—A complete new system of automatic control instruments for hospitals has been developed by the Minneapolis-Honeywell Regulator Co., 2604 4th Ave., S., Minneapolis 8, Minn.

Designed to make possible foolproof automatic control of almost all hospital equipment ranging from sterilization units and baby incubators to humidity and temperature regulators for operating rooms, the new units now are in production and ready for immediate delivery.

Instruments include: (1) complete boiler room controls and recorders, (2) water temperature controls for various applications throughout the building, (3) steam pressure control instruments for sterilizing, cooking, and laundry service, and (4) refrigeration and air conditioning controls.

Gas-Fired Unit Heater Designed for Commercial Use



No. 3621—Naco Mfg. Co., Huntington Park, Calif., is marketing a streamlined, gas-fired unit heater of the suspended type which is said to be ideal for use in stores, shops, auditoriums, and other installations where interior decoration is an important factor. It is identified as the "Pacific" suspended heater.

A feature, emphasized by the manufacturer, is the "Thermo-Flo" heating element, designed to deliver a fully balanced heat pattern. The heating element, fan assembly, and gas controls are completely enclosed.

YARWAY
STRAINERS
"Police the
PIPELINES"

YARWAY STRAINERS are *selling by the thousands* because they are better engineered for the service.

"The Screen is the Thing"—a high-grade, woven Monel wire screen that stops the dirt, lets fluids flow freely.

Then, too, purchasers like the *body finish—Cadmium plated* for protection against corrosion and for better appearance.

And last but not least, it is *"Easy to Clean"* having a steel blow-off bushing, precision machined with straight thread. Screen and bushing come out together—go back together, automatically aligning.

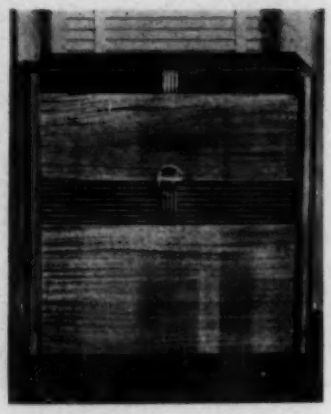
Six sizes, ½" to 2" for pressures up to 600 lb serve practically all strainer needs.

Sold by nearly 150 Mill Supply Houses. See your Supply House or write for Bulletin S-201.

YARNALL-WARING COMPANY
107 Mermaid Avenue PHILADELPHIA 18, PA.

YARWAY STRAINERS

Return Air Bypass Used in Packaged Conditioner



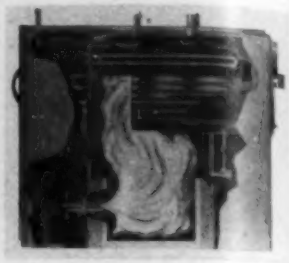
No. 3622—The air conditioning division of Remington Corp., Cortland, N. Y., has announced a new room air conditioning unit of the packaged type which is designed for use in the tropics but is suitable for use in this country.

This air cooled unit, the Model 10, has a combined sensible and latent cooling capacity of 10,500 Btu per hr, handles up to 400 cfm (of which up to 75 cfm may be outside air for ventilation), and has a total filter area of 240 sq in. One of the outstanding features is said to be the use of a bypass system for return air so that the ratio of latent to sensible cooling may be varied to suit the load.

A multi-cylinder "Freon-12" compressor is driven by a one horsepower motor, and centrifugal fans, driven by ¼ hp motors, are used to supply air to the condenser and to circulate conditioned air. The ventilating air first enters a high pressure fan which does not handle any of the recirculated room air. This fan, in turn, delivers the ventilating air to the evaporator fan. According to the company, the use of this two stage arrangement provides for a total static pressure difference between indoors and outdoors of ¾ in. This is said to be sufficient to assure positive ventilation independent of any outdoor air motion and building stack effect encountered.

Adjustable discharge grilles are designed to provide outlet velocities from 240 to 950 fpm.

Redesigns Line of Boiler-Burner Units



No. 3623 — York-Shipley, Inc., York, Pa., has placed on the market a completely redesigned line of oil-fired horizontal boiler-burner units. There are four sizes available, ranging from 252,000 to 468,000 Btu per hr maximum output at the nozzle.

The boiler itself is built of 5/16 in. plate in two sections which can be assembled on the job. The upper section contains horizontal 2 in. boiler tubes, rolled into the tube sheets. Each tube contains a spiral baffle. A system of water circulators between the upper and lower boiler sections keeps the boiler water in motion on the liquid side of the tubes.

All boiler and combustion chamber parts are said to be accessible for cleaning and maintenance through cover plates in the front and rear. A standard company burner, matched to the boiler capacity, employs an iris shutter for control of the air-oil mixture.

The burner uses the new catalytically cracked or thermally cracked oils in both No. 2 and No. 3 grades and can be adapted to steam, vapor, or hot water heating systems.

STANDARD *presents . . .*

NEW ALL STEEL STRAINER WITH 5 IMPROVED FEATURES

1. POSITIVE PROTECTION Standards exclusive seal ring design assures maximum protection, makes by-passing of foreign matter impossible.

2. LARGE SCREEN CAPACITY Screen area is over 20 times pipe area. Average open area 33%. Reduces servicing to a minimum.

3. FORGED STEEL FLANGES Forged steel flanges and forged strainer cap eliminates breakage during installation or in servicing.

4. ATOMIC WELDED Atomic Hydrogen welding insures a pressure tight homogenous structure.

5. EASE OF CLEANING Standard's featured pull-bar and bolted strainer cap make removal of screen easy and eliminates damage to strainer element.

For details write for bulletin No. S147

STANDARD

makes a complete line of bronze, semi-steel and stainless steel strainers.

STANDARD MACHINE & MANUFACTURING CO.

Designers-Manufacturers

ST. LOUIS 23, MO.

All-Steel Fabrication Used in Small Electric Motors

No. 3624** — A line of "Rotomotor", all-steel fabricated, fractional horsepower electric motors has been developed by General Die and Stamping Co., 262-272 Mott St., New York 12, N. Y.

Features are said to include specially designed baffles and louvers in the housing which result in low temperature rise. In addition, the manufacturer states that the motor life has been increased by using glass-insulated wire for the starting windings and by gun metal oxidation of the starting mechanism before assembly. Sealed ball bearings are used throughout.

While the company has been concentrating on split phase and capacitor start types in the 1/3 hp size for both 110 and 220 volts, a complete line from ⅛ to 1 hp in both the split and three phase types is planned.

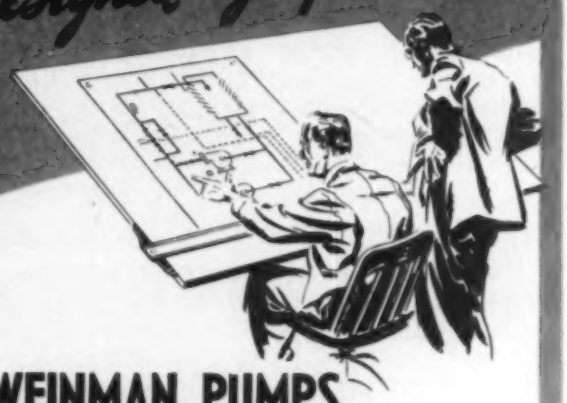
Equipment Shorts

Title to the large industrial plant located in Syracuse, N. Y., and built by the Navy in 1942 has been acquired by the Carrier Corp. of that city. The purchase was made from the War Assets Administration and is a part of the company's 12 million dollar expansion program for the manufacture of air conditioning and refrigeration equipment. This property, which will provide an additional 600,000 sq ft of production space, is adjacent to land and buildings purchased by Syracuse University, from the WAA, for its engineering college and its Institute of Industrial Research.

Davis Emergency Equipment Co., Inc., 45 Halleck St., Newark 4, N. J., has announced new developments and improvements in its continuous, combustible gas alarm system (remote head type) which is designed to detect the presence of combustible vapor and/or gas and to give an audible signal before the mixture becomes dangerous. The basic principle of the system is the effect of combustion on a heated filament in the analyzer head, located in the area to be sampled. The combustion raises the temperature and resistance of the filament, and part of the current is diverted through a meter, calibrated in terms of the lowest explosive limit of the gas or vapor being detected.

The Apex Engineering Co., Chicago, has licensed the Illinois Apex Engineering Co. of the same city to sell all its products and services in that state. The licensor continues to operate as before, the new company taking over all sales of these products and services in its state. President of the new company is A. E. Ryan, the vice president is Geo. E. Wilder, the secretary is Walter Rojek, and the treasurer is E. J. Ostermeier. Messrs. Ostermeier, Ryan, and Rojek have also announced formation of the R-O-R Construction & Engineering Co. to develop the use of red cedar 4 x 4's (in 8, 12, 16, and

Designed by Specialists

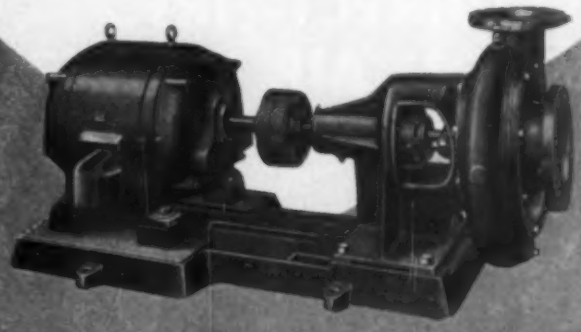


WEINMAN PUMPS
For Cooling Systems

Weinman pump specialists have designed dependable pumps specifically for installation in cooling systems where quiet, efficient and leakless performance is most desirable.

The side-suction construction of Type GB and KB Centrifugal Pumps makes it easy to place the discharge opening in any one of four positions — even 8 positions at 45° intervals may be had if specifically ordered.

Write for Bulletin 727-B2.



Weinman Type KB Pump. Capacities to 1100 GPM, motor ratings of from 1 hp to 40 hp with 1750 or 3450 rpm.

Weinman pump specialists are always available to help you with any pump problem. Write, wire or 'phone — you will get immediate attention.

Built by Centrifugal Specialists

The WEINMAN Pump Mfg. Co.

COLUMBUS · 8 · OHIO

Equipment Shorts (Cont.)

20 ft lengths) for simplified wall construction for low cost buildings.

Minneapolis-Honeywell Regulator Co. has organized a new subsidiary company, named Honeywell A. G., in Switzerland. The Swiss organization, which has started operations, will handle sales and service of the company's complete line of controls.

The Young Radiator Co., Racine, Wis., manufacturer of heat transfer products for heating, cooling, and air conditioning, recently observed its twentieth anniversary and at that time organized an employees' 20 year club. In a recent interview, F. M. Young, president, said, "We are sort of proud of our growth in these few short years. ..... Our experience gives us confidence, but the rapid advance in the physical sciences will give us plenty of opportunity to think."

The Sporlan Valve Co., Inc., is now located in the new Sporlan Bldg., 7525 Sussex Ave., St. Louis 17, Mo. The new building contains the executive and general offices together with the shipping and repair departments.

Chicago Metal Hose Corp., Maywood and Elgin, Ill., recently announced the purchase of all the capital stock of Fort Dearborn Mfg. Co., Sterling, Ill.

The new subsidiary will continue its services in the field of production machining and as engineers and builders of special machinery, tools, dies, and fixtures.

Since the war, Chicago Metal Hose has been developing tooling and equipment for a new line of stainless steel and copper expansion joints for pipe lines. This program of tooling has been completed, and production space will now be made available. Additional space will also be available for the expanded production of the company's regular lines of flexible metal hose.

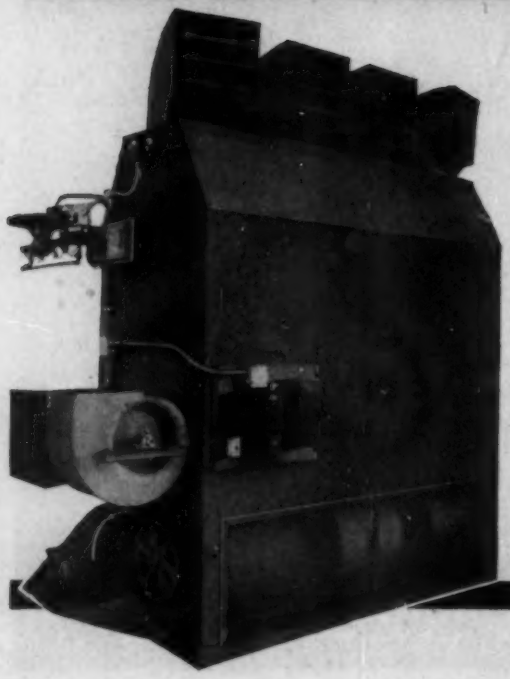
Production of fractional horsepower motors has been boosted to an all-time high at General Electric Co., Schenectady, N. Y., through a standardization program coupled with increased manufacturing facilities. But supply has not yet caught up with demand for certain types, according to A. W. Bartling, manager of the company's fractional horsepower motor division.

Even though output this year will be "considerably above" the average rate for the prewar years 1936-1940, motors for washing machines, fans, blowers, sump pumps, and similar applications are still in short supply, Bartling said. These are constant speed a-c motors rated from 1/6 to 1/3 hp.

A considerable share of the company's gains in small motor production is attributed to an industry-wide fractional horsepower motor standardization program. Shipment of many models is already on an "off the shelf" basis and will be true of most standard models by the end of 1948, according to Bartling.

AIRTHERM
DIRECT-FIRED
WARM AIR HEATERS

Offer You These Six Heating Advantages



1. A complete factory heating unit.
2. Comes to you ready to set in place.
3. Control system wired at factory.
4. Available in floor-mounted or suspended models.
5. Oil burners or gas burners are interchangeable to meet future fuel conditions.
6. Capacities from 650,000 to 1,950,000 BTU per hour.

For detailed information, write for Bulletin 801-A.

AIRTHERM
MANUFACTURING CO.
711 South Spring Ave. • St. Louis, Mo.

Executive Changes (Cont.)

EXECUTIVE CHANGES

J. H. Thomas, who has been vice president in charge of sales since 1946, has been named vice president and purchasing director of Owens-Corning Fiberglas Corp. B. S. Wright is now general sales manager. Mr. Thomas has been with the firm since it was organized in 1938, and prior to that time was associated with the Owens-Illinois research activities that resulted in the invention and development of "Fiberglas" air filters, insulating wool, etc. According to a recent company announcement, these changes were brought about by the resignation of G. E. Gregory, formerly vice president and purchasing director, who will become president of Morton-Gregory Co., Inc., a new organization formed to manufacture and sell new industrial and consumer products calling for large scale use of "Fiberglas" yarns.

The Howell Electric Motors Co., Howell, Mich., has announced the appointment of C. T. Button as general sales manager. Mr. Button is well known throughout the electrical industry and is a member of the American Institute of Electrical Engineers and the Engineers' Club of Dayton, Ohio.

M. W. Crew, manager of the industrial control division, Perfex Corp., Milwaukee, has been elected first vice president of the Smoke Prevention Association of America. An authority on boiler controls, he has been active for many years in various associations and engineering societies and for the past two years has served as chairman of the Fuel Conservation Council.

R. E. Hollinshead has joined Surface Combustion Corp., Toledo, as assistant sales promotion manager of the "Janitrol" division. He will develop, produce and conduct the sales training and promotion activities for this division.

According to a recent announcement, H. F. Dean, heating engineer and former member of the Stoker Manufacturers Association engineering committee, has been appointed director of research for Conco Engineering Works, Mendota, Ill. A University of Illinois graduate, he joined the company in 1924, advancing through the positions of sheet metal works foreman, shop superintendent, and chief engineer. In his new position he will coordinate and supervise research and new developments on the company's commercial and domestic stokers, gas and oil-fired warm air heating units, conversion oil burners, and handfired furnaces.

Stephens-Adamson Mfg. Co., Aurora, Ill., has promoted A. W. Ostberg, formerly purchasing agent, to assistant manager of the merchandise division. He will be in charge of the coordination of sales and production of the company's line of standard box car loaders, car pullers, winches, and speed reducers. E. K. Race has been named as the new purchasing agent.

Reports like these from users*. . .

"Balancing Armatures at Production Line Speed"
"Band-Saw Wheels Made Smoother Operating"
"Speedy Balancing of Propellers to 3 Mils"
"The Model 375 Has Been Found Highly Adaptable"
"Eliminated Vibration, Increased Bearing Life in Giant Fan Wheels"

prove how Bear Dy-Namic Balancing can help you!

The experience of leading manufacturers has shown how Bear Dy-Namic and Static Balancing can cut time and labor costs and give accurate, dependable results . . . at production line speed. Bear Balancing Equipment is engineered for low cost, extreme sensitivity and simplicity of operation . . . any shop hand can learn Bear Balancing in half a day.

There's a Bear Balancer for every rotating body . . .

From tiny armatures to giant crankshafts . . . from a few ounces to several tons . . . there's a Bear Balancer available to handle every job . . . in fact, practically everything that rotates can, and should, be Bear Balanced.

If the equipment you manufacture includes a rotating, rolling or revolving body, Bear invites you to send a sample or blue print of the body to be balanced. Give weight, dimensions and speed at which equipment operates. Bear Engineers will send complete details on the machine adapted to your particular problems. There is no obligation.

*Reports from actual Bear Equipment Users will be sent on request. BEAR MFG. CO., Dept. H-16, Rock Island, Illinois. 2337R

Write for the Bear Industrial Bulletin TODAY!

BEAR
COMBINATION
STATIC AND DY-NAMIC BALANCING MACHINES

SMART ENOUGH
NOT TO WORK
ON THAT!

A squirrel has a hard time making a living. He can't afford to do useless and unprofitable work.

So, he inspects every nut he picks up. If he gets hold of a bad one, he throws it away.

The plumber or steamfitter doesn't have to inspect "K" fittings. Bad ones are thrown away at the factory. This saves the work and grief which would result from misalignment, leaks, call-backs.

Insist on "K" fittings.

- Standard and Extra Heavy Cast-Iron Screwed Fittings
- Standard Flanged Cast Fittings
- Standard and Extra Heavy Companion Fittings
- Drainage Fittings

Catalog on request

KUHNS BROTHERS CO.
Dayton 1, Ohio

K PRECISION FITTINGS

COMBINED MARKET FACILITIES at Malleable Iron Fittings Co., Branford, Conn., and at Kuhns Bros. Co., Dayton, Ohio.

Executive Changes (Cont.)

Crocker-Wheeler Electric Mfg. Co., Ampere, N. J., a division of Joshua Hendy Corp., has announced the appointment of P. J. Moore to the newly created position of director of sales and engineering. An electrical engineer, Mr. Moore has been engaged in the engineering and selling of electric motors and generators for 24 years.

W. E. Butts, a director for the past several years, has been elected president of Enterprise Engine & Foundry Co., San Francisco, to succeed Charles Hoehn, Sr., who is retiring from 30 years direction of the company's activities in the diesel engine, oil burner, and food processing machinery fields. In addition to his new duties, Mr. Butts will retain his present capacity as vice president of General Metals Corp.

R. H. Newton is now manager of the newly created office of dealer sales for Lincoln Electric Co., Cleveland. He will develop an organization to sell and service welding in the small manufacturing, service industry, and agricultural fields. The company's policy of selling to the industrial field through direct technical representatives will not be changed, and according to the company, the policy of assisting manufacturers to design for welding through engineering service will be strengthened.

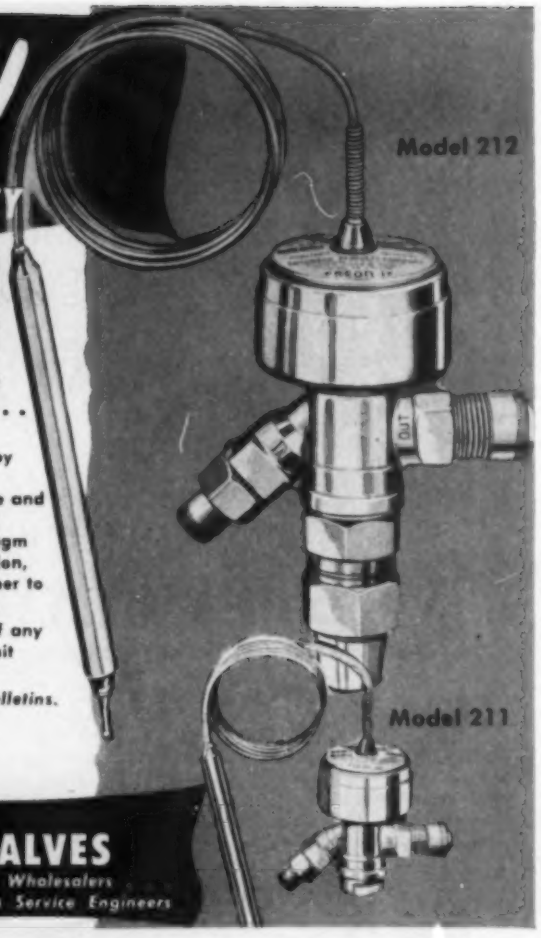
The James F. Lincoln Arc Welding Foundation has appointed Professor R. S. Green of the department of industrial engineering, Ohio State University, as editor-in-chief of the foundation's new book, Design for Welding. The book will be a comprehensive survey of the latest developments in welding design and will be based on outstanding papers submitted in the foundation's $200,000 award program, which closed last June. In addition to forming the basis for the book, the award papers will be bound and placed in the A. F. Davis welding library at Ohio State University where they will be available for general use by industry. Prof. Green is in charge of Ohio State's five year course in welding engineering, the only course of its kind in this country leading to a graduate degree in welding engineering.

Announcement has been made by the New York Blower Co. of the appointment of E. E. Trickler as general sales manager to fill the vacancy caused by the recent death of Henry Mathis. Mr. Trickler will also continue to serve as chief engineer, superintending all engineering developments.

R. H. Morse, Jr., who started in 1929 as an assistant in the pump and electric department, St. Paul, Minn., branch of Fairbanks Morse & Co., Chicago, has been named manager of the company's pump division.

Young Radiator Co., Racine, Wis., manufacturer of heat transfer products, has appointed W. E. Becker purchasing agent in charge of purchasing and procurement requirements. Mr. Becker has been associated with the company for the past 14 years and is a member of the National Association of Purchasing Agents.

A-P SCORES AGAIN
IN
REFRIGERANT CONTROL ACCURACY



New A-P DEPENDABLE Models 211 and 212 VALVES

Augmenting The Already Complete Line of A-P Dependable Valves
To Be Used Where A Limiting Pressure Feature Is Desirable . .

A necessity and money-saving convenience on many modern systems, the new A-P Model 211 and 212 Expansion Valves avoid all those service problems caused by motor overloading at sharp peak loads or during pull down. Amazingly simple in construction, Models 211 and 212 use only one spring and one needle pin. A unique and entirely new diaphragm unit limits the operation suction pressure to a predetermined setting. Should the pressure build up to a point approaching overload, this diaphragm actuates the needle pin, allowing the valve needle to move towards the closed position, until the overload condition has passed. Then the valve operates in the normal manner to control superheat through the thermostatic bulb and sensitive large-area diaphragm.

Model 211 is non-adjustable. Model 212 is adjustable, and may be used in place of any standard thermostatic expansion valve of similar capacity. Types are available to limit pressures to 15, 40, and 55 lbs. Freon 12. Capacities: ½, 1 and 1½ tons Freon.

See Your Refrigeration Equipment Wholesaler for Complete Details, or Write for Bulletins.

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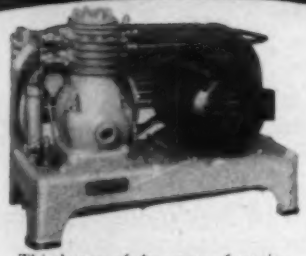
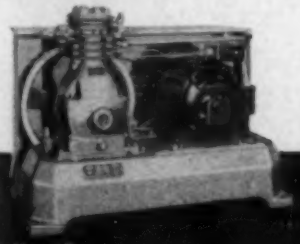


This is one of the types of equipment you could sell for us—1 HP air-cooled condensing unit—Methyl Chloride and Freon—12.



1½ HP water-cooled condensing units. Methyl Chloride and Freon —12.

Here is a real profitable opportunity for you if we have no sales and service representative in your locality and if you are able to qualify.

We are looking for adequately financed individuals or firms who have some experience in the air conditioning and commercial refrigeration fields. Personal integrity, enthusiasm, energy and a spirit of cooperative effort are factors that count heavily, as well as some knowledge of the market we would like to reach . . . . . and the various applications to which our equipment can be put.

We have the finest engineered line in the industry . . . . worthy of the finest type of representation. LIPMAN Machines are built in sizes ranging from ¼ to 40 horsepower, making it possible to obtain machines that are suited for all requirements. Designed to use Ammonia, Methyl Chloride and Freon refrigerants.

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DIVISION
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Burns natural gas, manufactured gas and liquified petroleum gas. Luminous flame radiates heat two to three times faster than a blue flame. Available for vertical or horizontal firing.

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This new and unique design in suspended space heaters features: More Head Room — Compact Design—More Heat from gas burned —Less Noise.

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NEW BOOKS & REPORTS

Finds Heat Pump Economical in the South—Diesel-Driven Units Studied

The relatively mild climate found in southern states, particularly Florida, lends itself to economical and efficient heat pump installations, and the use of diesel-driven compressors may provide, in some cases, lower operating costs than can be obtained by other means.

These conclusions, among others, are contained in a 48 page bulletin, Reverse Cycle Refrigeration for Heating in the South, by S. P. Goethe, research engineer, Florida Engineering and Industrial Experiment Station, University of Florida. The booklet is the result of an investigation to show the present state of development of the reverse cycle refrigeration system for heating in the South—both with electric-driven compressors and with internal combustion engine-driven compressors. A research grant from the American Society of Refrigerating Engineers partially defrayed the expenses incurred in the preparation of the material.

While a considerable amount of space is devoted to a review of the much publicized advantages of this type of heating, to a discussion of the basic thermodynamic principles, and to data on Florida weather and water temperatures, the bulletin should be of interest to those who are using or are contemplating the use of heat pumps. Specific examples are used throughout as a basis for setting up methods of calculation and preparing charts showing operating performances and costs. However, as stated by the author, the methods are applicable to any type of installation and can be used as a pattern for determining the size of equipment, predicting performance, and estimating operating and owning costs.

The performance of a 20 hp hermetically-sealed "Freon-12" compressor used in an indirect expansion system is shown in a series of charts which serve to demonstrate the effects of different water temperatures, rates of water flow, and different condensing temperatures. As shown on additional charts, the capacity of the system is also dependent on the performance of the water heating coil selected.

Similar treatment is given the direct expansion system and the internal combustion-driven heat pump. In the case of the latter the author states that a gain in thermal efficiency is possible but he points out that "from an unbiased viewpoint it must be acknowledged that most of the inherent advantages of the electric-powered system are sacrificed to obtain this gain in thermal efficiency." The data on heating capacity, fuel consumption, and relative costs for this type of system are based on a proposed installation wherein the heat energy of the cooling water and exhaust gases are utilized.

Of considerable interest are the data comparing the operating costs of four systems together with a chart showing estimated annual owning costs for six types of heat pump installations in a hypothetical installation in Jacksonville, Fla.

The specific data are not applicable to most sections of the country, and most readers will regret that no information on the ground as the heat source is included (experimental studies on this important phase are

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Select the Right Insulation: Any insulation will save *some* money—but only the right insulation, correctly applied, will save the *most* money for the longest period of time. Because of its many advantages, leading refrigerating engineers have long relied on J-M Rock Cork Insulation for refrigeration service.

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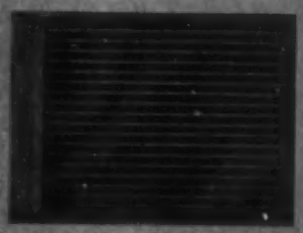

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A time proven heating unit, modern streamlined in design, quiet, yet its rugged construction adapts it to all types of installations, guaranteed for use on No. 150 p. s. i. steam pressure. All copper heating element, individual spiral fin tubes free to expand without strain on joints. Standard motors with standard bases used. Wide range of capacities.

Save fuel with McCord Unit Heaters.

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planned by the experiment station) but the methods of setting up cost comparisons are applicable to all installations. The bibliography contains 18 references to published material (including five articles from HPAC).

Copies of this paper-covered bulletin (No. 14) may be obtained from the Florida Engineering and Industrial Experiment Station, College of Engineering, University of Florida, Gainesville, Fla.

Outlines Physiological Problems Facing Air Conditioning Engineers

The object of the engineer in dealing with problems of physiology and hygiene is to produce results or conditions so that the problems cease to be medical or physiologic and become simple routine engineering control. Since it is the function of the physician to diagnose and treat disease, the determination of the cause of disease is a free field for both the engineering and medical professions, in the opinion of Dr. Philip Drinker of the Harvard School of Public Health. He also states that it is the engineer's job to produce environmental conditions which prevent disease. Emphasizing that no engineer worthy of his profession would encroach on the proper sphere of the physician, he mentions some of the spectacular improvements in public health which have resulted from cooperative efforts, and some of the unsolved and vexing problems are outlined in a paper, Physiological Problems Encountered in Engineering, published in the Proceedings of the 1947 annual meeting of the Engineering College Research Council.

Advances and problems still to be solved are briefly described in regard to comfort conditions, air sterilization, living and working at low and high pressures, industrial toxicology, and industrial fatigue.

The 71 page, paper bound booklet also contains four papers constituting a symposium on the relation of college research organizations to industry, other papers on new research problems confronting engineers, and the annual reports of the research council. Copies of the Proceedings are available at $1.00 each from the headquarters of the Engineering College Research Council, State University of Iowa, Iowa City.

Says Guided Bend Test Unfair to Welding Operator

Though the guided bend test is generally used as a qualification test for welding operators, the electrode and the plate material are important factors which may put two strikes on the operator before he begins the test.

L. K. Stringham, in charge of welding application, Lincoln Electric Co., discusses these factors in a paper, Failures in Guided Bend Qualification Test Often Due to High Tensile Pipe, contained in the September issue of the Welding Journal, published by the American Welding Society, 33 W. 39th St., New York City.

According to the author, as the test is now written, it cannot be regarded as a sound test for qualifying operators, or for that matter, electrodes, because pipe of 75,000 psi or higher tensile strength will probably fail if there are slight flaws or notches in the surface that is in tension. Since all commercial pipe is certain to have some flaws or imperfections, specimens cut at random from such pipe will not all pass the test (all weld specimens cut from a welded joint must pass the guided bend

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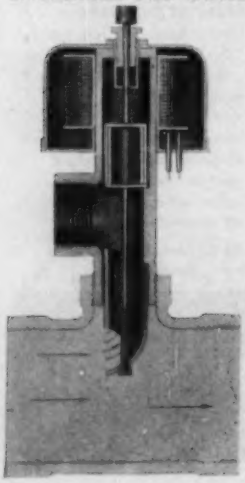
Temperatures as desired can be secured in each separate zone. Zoning of all or parts of panel heating coils, mains or risers can be accurately done with thermostatic operated ZONE-MASTER CONTROLS.

Circulation for temperature balance can be secured throughout the heating system with emersion operated ZONE-MASTER CONTROLS.

With the use of ZONE-MASTER CONTROLS no changes occur in the pumping head to change the static balance of other branches of the circulating system as takes place with the use of PUMPS FOR ZONING.

MASTER FLO-CONTROLS ARE NOT VALVES

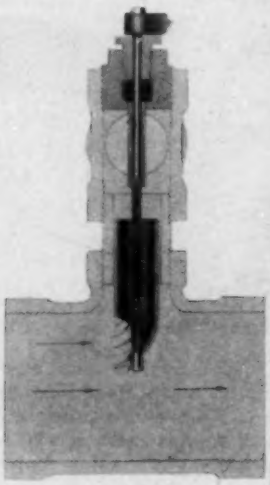
The MASTER FLO-CONTROLS operate with the PATENT MOVING INTERCEPTOR STREAMLINED TUBE that intercepts the flow, directing same without loss through the tube into the branches resulting in 100% diversion with less friction than required for conventional pipe tees.



The MASTER FLO-CONTROLS are not valves or fittings with flat pedal interceptors that allow the flow to slip out over the sides of the interceptors, but are streamlined interceptor tubes.

← The ZONE-MASTER regulates the flow thru the streamlined interceptor tube operated by a solenoid or motor under the control of a thermostat or emersionstat.

Flow distribution thru the ZONE-MASTER can be manually adjusted during circulation for balanced temperature circulation.



← The FLO-MASTER regulates the flow thru the streamlined interceptor tube by manual adjustment during circulation for balanced temperatures.

Changes in the desired temperatures can be made by manual adjustment during circulation.

•

MASTER FLO-CONTROLS ARE INSTALLED IN CONVENTIONAL PIPE TEES ELIMINATING LARGE STOCKS OF SPECIAL FITTING.

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MASTER FLO-CONTROLS built with the interceptor streamlined tube ELIMINATES ALL WATER NOISES caused by special fittings with fixed partitions, jet pipes, valve interceptors and other obstructions to the flow of water that result in high circulating pressures.

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It's Naylor Light-weight Pipe

Here's the pipe structure that's ideal for ventilating and air conditioning jobs no other light-weight pipe can handle. Naylor's exclusive Lockseam Spiralweld provides the strength and safety you would expect only in a heavier-wall pipe. Sizes from 4 to 30 inches in diameter with all types of fittings, connections and fabrications.

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test if the operator is to qualify). Normal bead ripples or tiny depressions which are not ground out are likely to produce failure at the fusion line even though the weld metal is solid and ductile. Normally, pipe of approximately 60,000 psi tensile strength is sufficiently ductile so that relatively large notches or flaws in the surface in tension will not cause failure in the test.

Gives I-B-R Ratings for Cast Iron Boilers

A new edition of the booklet, I-B-R Ratings for Cast Iron Boilers, has been published by the Institute of Boiler and Radiator Manufacturers and includes all I-B-R ratings for cast iron boilers being offered by 18 manufacturers. The data shown include not only gross and net ratings but also burner capacities and chimney sizes.

Ratings are based on actual output under test, regardless of design, heating surface, or grate area. The purpose of the Institute's code is to insure to heating engineers, architects, builders, the trade, and consumers that boilers will deliver the output which is stamped on the boiler nameplate when such ratings are accompanied by the Institute's emblem.

The booklets may be purchased at 50 cents per copy from Institute headquarters, 60 E. 42nd St., New York 17, New York.

Journal of Commerce Advises on How to Sell to the Government

To help more businessmen get their share of sales in the five billion dollar annual government market, the New York Journal of Commerce has issued a new 32 page booklet designed to take the mystery out of bidding and contract procedures. The booklet is titled, How to Sell to the Government.

It is a consolidation of a series of detailed studies made by the business newspaper on the federal, state, and municipal markets of the nation. It is prepared as a guide to manufacturers, jobbers, and dealers alike. The 14 chapters and many illustrations explain the nature of the various government markets and tell how to get on mailing lists for materials and products wanted. There are special sections devoted to the many agencies of the federal government as well as to state and municipal governments. Lists of men and offices who buy for federal government bureaus and agencies are included. Instructions are given for bidding, and a discussion is devoted to the details of government specifications and specification indexes.

Copies may be obtained from the Journal of Commerce, 63 Park Row, New York 15, N. Y., at 50 cents each.

Outlines Fire Prevention Methods for Management, Employees

To assist business and industry in reducing the increasing number of fires that last year destroyed more than a quarter of a billion dollars worth of factories, plants, and stores, killing hundreds of workers, the National Board of Fire Underwriters has published a 16 page booklet, Stop Fire—Save Jobs.

Designed to help management and labor cooperate in a sound program of fire prevention, the booklet points

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Water Cooling Towers
Air conditioning systems require "so many" gallons of water per minute cooled "so many" degrees. With this and other data, we design and erect water cooling towers and guarantee results. During 50 years' experience with cooling towers of all types, we have made installations in practically every State and in many foreign countries. Illustration at left shows inside of a C. H. Wheeler Mechanical Draft Cooling Tower. Outside Casings may be steel, wood, masonry, or transite. Descriptive bulletin sent on request.
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WHEN the refineries, power plants and chemical process plants needed a medium to absorb combined axial and lateral movements in high temperature lines, Zallea supplied the answer. The Zallea Universal Expansion Joint is capable of absorbing movement of the line in any direction—axially, laterally or angularly, or any combination of these.

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Particularly suited for catalyst lines—since the joint offers no sharp crevices in which catalyst can pack—the Zallea Universal Expansion Joint has numerous applications in reactor risers and standpipes, regenerator standpipes, stripper and flue gas lines.

Zallea Universal Expansion Joints are specifically designed to fit the requirements of each individual application and can be designed for all temperatures and pressures. Send today for Catalog 47 containing complete information to: Zallea Brothers & Johnson, 816 Locust Street, Wilmington 99, Del.

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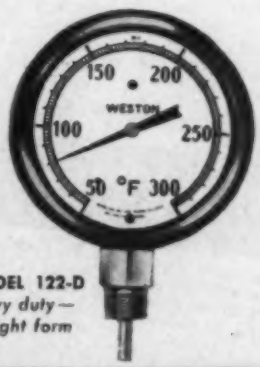
Clear, boldly marked scales make Westons preferred on overhead ducts and other inaccessible locations. Easily mounted at any angle for convenience in reading. Sturdy, all-metal Weston construction assures years of accurate dependability.

Available in sizes, ranges and stem lengths for most applications. Ask your local jobber or Weston representative for complete information. Weston Electrical Instrument Corporation, 648 Frelinghuysen Avenue, Newark 5, New Jersey.



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MODEL 221-D
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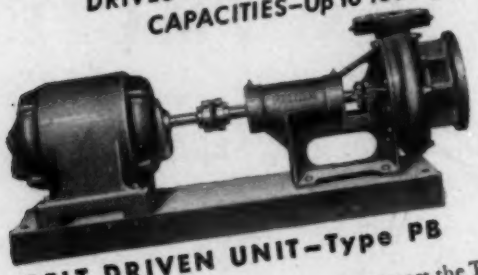

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Integrally cast iron frame and bearing mounts support the Type PB in same manner as Type PE. A precision steel shaft, turning in grease lubricated ball bearings is keyed to either V or flat belt pulley as specified, or can be direct connected to standard stock motor through a flexible coupling, as shown in the view above.

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out that industrial fires also cause losses in unemployment, lost production, and business failures two or three times greater than the dollar property loss. It tells how to detect and remove hazards that are common to most industries and shows how to eliminate special hazards found in many businesses.

The booklet also seeks to inform employees about the basic elements of fire protection, so they will recognize the operation and importance of sprinkler systems, fire extinguishers, automatic alarms, fire doors, exit drills, and other safeguards. Panic prevention and first aid are outlined.

Copies may be obtained free from the National Board of Fire Underwriters, 85 John St., New York 7, N. Y.

SMA Manual Lists Stoker Manufacturers, Gives Industry Data

A new and fifth edition of the Information Manual, published by the Stoker Manufacturers Association, gives detailed listings of manufacturers and associate members, committees, officers, by-laws, and other general data on the association and the stoker industry.

All of the information in this manual has been brought up to date. Additional copies are available at 50 cents each, postpaid, from association headquarters, 307 N. Michigan Ave., Chicago 1, Ill.

Other Books and Reports Received

History of the Development, Manufacture, and Calibration of HEI Standard Flow Nozzles, published by the Heat Exchange Institute, 90 West St., New York 6, N. Y. Free distribution of a pamphlet describing the background of a project undertaken by the institute to provide standardized flow nozzles for the steam jet ejector industry. Standardized nozzles have been developed and calibrated by the National Bureau of Standards, and the institute has authorized the American Instrument Co. to reproduce nozzles and adapters for public sale.

Literature Review on Corrosion of Metals and Materials by Flue Gas Condensate, by H. A. Pray, F. W. Fink, and R. S. Peoples, contains a summary of the current literature and thought on the status of the cause and effects of corrosion of metals used in gas appliances by flue gas condensate. While the report refers particularly to heating applications, it is probable that the information contained will apply to other situations where metal flues are used to carry off products of combustion from gas-fired equipment. The 29 page booklet was prepared by Battelle Memorial Institute and is designated as Report No. 1 to the American Gas Association, committee on domestic gas research. For copies write to AGA headquarters, 420 Lexington Ave., New York 17, N. Y.

Lessons in Arc Welding, third edition, published by Lincoln Electric Co., Cleveland, contains 158 pp., 228 illustrations, and is priced at 50 cents per copy. This is a completely revised book designed to assist both new and experienced welders by instructions in all phases of arc welding. Being a book of practical instructions, it contains 58 lessons based on the experiences of Arthur Madson, head instructor in the company's arc welding school.

will be held at the Chalfonte and Haddon Hall hotels

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Confidence in K & M steam plant equipment is founded partly on K & M experience that dates back 68 years. And partly on the many K & M "firsts" of yesterday. But the chief reason for the acceptance of K & M products today is the K & M approach — the policy of *continued* pioneering that has *kept* K & M "first for dependability" for so many years.

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Dealers coast-to-coast.

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. . . in Tool Sharpening, Grinding, Wire Brushing

Now, Black & Decker gives you everything you want in modern bench grinding equipment . . . *all in one complete line!* There are three streamlined Bench Grinders to help you keep a keen cutting edge on all your tools—grind pipe, rings, connections, fixtures, etc.—wire-brush, buff, burnish, polish and finish sheet metal—remove weld marks and burrs. And our new accessories, like illuminated eye shields, grinder pedestals and back-stand idlers, make them even more efficient.

These Bench Grinders are packed with new, postwar features to do a faster job at lower cost. Ask your nearby Black & Decker Distributor for details today . . . and for information on other Portable Electric Tools for heating, piping and air conditioning work. Write for free catalog to: The Black & Decker Mfg. Co., 628 Pennsylvania Ave., Towson 4, Maryland.

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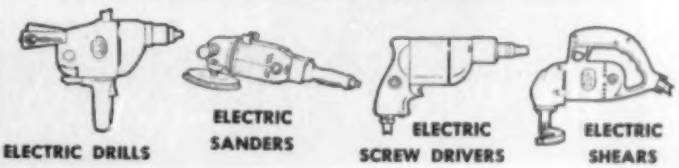

700 Series

MEETINGS & CONVENTIONS

SBI Announces November Meeting

The fall meeting of the Steel Boiler Institute, Inc., 1207 Land Title Bldg., Broad and Chestnut Sts., Philadelphia 10, Pa., will be held at the Chalfonte and Haddon Hall hotels, Atlantic City, November 11.

Housing Officials to Discuss Problems During Meeting

The National Association of Housing Officials, 1313 E. 60th St., Chicago 37, Ill., will hold its 14th annual meeting at the Hotel New Yorker, New York City, November 17 to 20. The second annual exhibit of building and maintenance products will be held simultaneously for this group, composed of executive directors, non-salaried commissioners, engineers, maintenance superintendents, architects, and other management personnel connected with permanent public housing. Housing principles for 1948, the federal role in the current housing program, functions of the local housing authority, disposition of war housing, fundamental housing management concepts, housing costs, urban redevelopment, Title V management problems, and maintenance practices are some of the subjects to be considered.

ASME Annual Meeting Scheduled for December

The 1947 annual meeting of The American Society of Mechanical Engineers, 29 W. 39th St., New York City, will be held at the Chalfonte and Haddon Hall hotels, Atlantic City, Dec. 1-5.

NHWA to Hold First Convention

Merchandising, dealer-wholesaler relationships, manufacturer-wholesaler relationships, laws affecting business operation, and the exchange of local credit information are some of the subjects to be discussed at the first annual convention of the recently formed National Heating Wholesalers Association. The meeting will be held at the Hotel Cleveland, Cleveland, Ohio, on December 3, one day prior to the annual convention of the National Warm Air Heating and Air Conditioning Association.

Panel Heating, Fuel Forum to Highlight NWAHACA Meeting

A report on panel heating in the research residence at the University of Illinois and a forum session on fuels will highlight the 34th annual convention of the National Warm Air Heating and Air Conditioning Association, 145 Public Square, Cleveland 14, Ohio. The meeting, to be held December 4 and 5 at the Hotel Cleveland, Cleveland, Ohio, will also include reports on research progress, installation codes, the Michigan State College short course, and indoor comfort conferences, together with a discussion of extended plenum duct systems.

ASRE Technical Papers to Feature Annual Meeting

The 43rd annual meeting of the American Society of Refrigerating Engineers, 40 W. 40th St., New York City,

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THE NEW - - - - Vulcan continuous line Radiation giving off adequate, uniform convected heat from floor to ceiling.
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Vulcan Radiation is of rigid construction made by mechanically imbedding offset fins or plates on tube or pipe.
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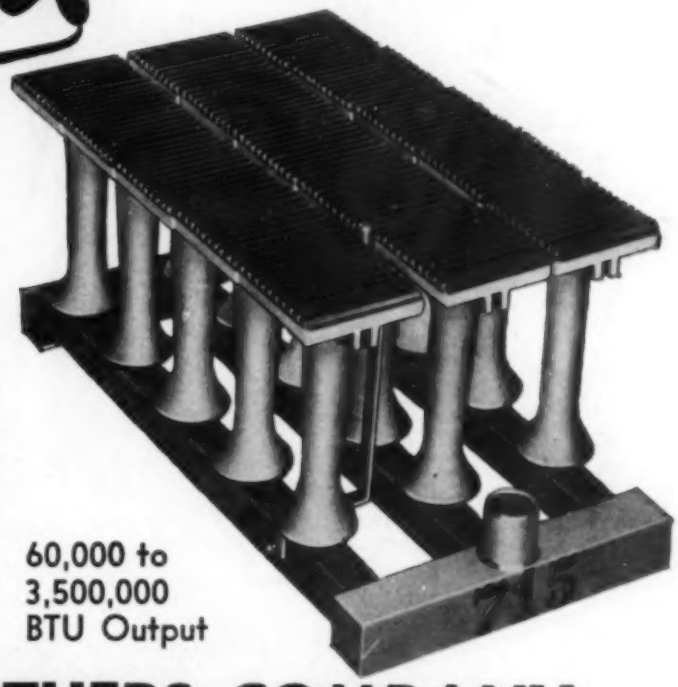

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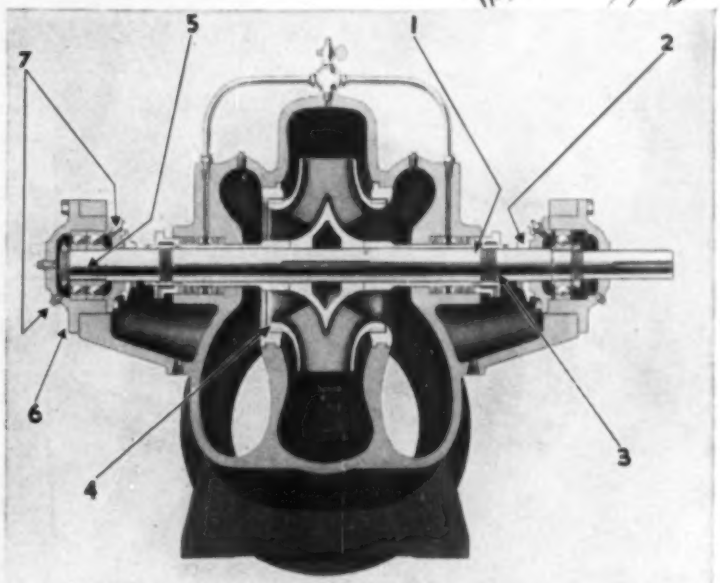

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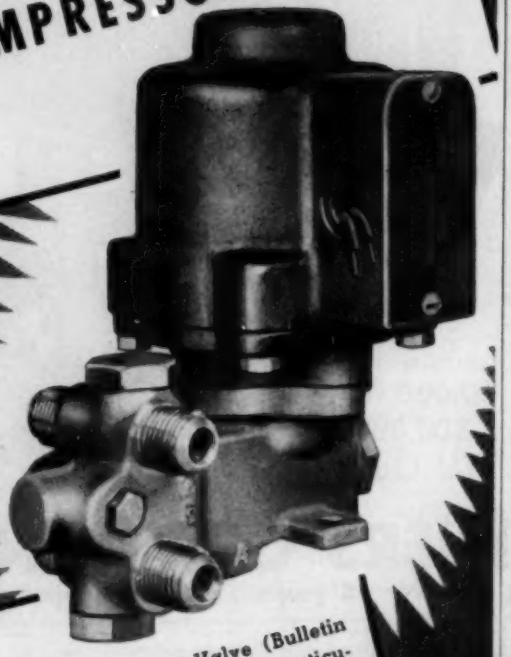

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will be held December 8 to 10, in Atlantic City, with headquarters at the Hotel Traymore. Highlights of the three-day session will include papers on mechanical developments in marine refrigeration, refrigeration as applied to concrete dams, greenhouse air conditioning, and the heat pump. Although the convention does not officially open until Monday, December 8, a number of committee meetings and advance registration are scheduled for the preceding Sunday afternoon. The Philadelphia section of the society will act as host for the occasion, with plans for entertainment features now under way.

Expects Adequate Housing for Refrigeration, Air Conditioning Show

Adequate housing accommodations for persons attending the 5th All-Industry Refrigeration and Air Conditioning Exposition in Cleveland, January 26 to 29, are practically assured according to F. J. Hood, chairman of the show committee. The Refrigeration Equipment Manufacturers Association, sponsor of the show, has arranged to handle all reservations through the Cleveland Convention and Visitors Bureau. Early applications are urged as some trouble may be encountered in obtaining rooms at the last minute.

ASHVE Invites Other Societies to Annual Meeting, Exposition

The American Society of Heating and Ventilating Engineers, 51 Madison Ave., New York 10, N. Y., is inviting other societies and their members to attend its 54th annual meeting at the Hotel Commodore, New York City, February 2 to 5 and coincident with the 8th International Heating, Ventilating, and Air Conditioning Exposition. This show, which now has nearly 300 exhibitors, is being sponsored by the Society and will be held in New York's Grand Central Palace. For further details see the ASHVE Journal Section in this issue.

OHI Exposition to Emphasize New Products

The silver anniversary convention and exposition of the Oil-Heat Institute of America, 6 E. 39th St., New York 16, N. Y., will be held in the Chicago Coliseum, April 5 through 8. According to a recent announcement, all branches of the industry will take part, novel presentations based on television are being planned, and special emphasis will be given new products.

HPACCNA Chooses Pittsburgh for Meeting

The Heating, Piping and Air Conditioning Contractors National Association, Rockefeller Center, 1250 Avenue of the Americas, New York City, has chosen Pittsburgh as its convention city for 1948. The association's 59th annual convention will be held June 1-5 at the Hotel William Penn.

REMA Schedules November Exposition for 1949

The 6th All-Industry Refrigeration and Air Conditioning Exposition will be held in Cleveland, the week of November 7, 1949. Announcement was recently made by the Refrigeration Equipment Manufacturers Association, sole sponsor of the show.